MOSQUITO CONTROL 1975

Municipal Abatement Programmes:

London
Mara Township
Wallaceburg
Orillia

SB
945
.M75
M69
1975

Ontario

Ministry of the Environment

The Honourable
Harry C. Parrott, D.D.S.,
Minister

Graham W. S. Scott, Q.C.,
Deputy Minister

HAZARDOUS CONTAMINANTS
TORONTO, ONTARIO M4V 1P5

Ref 20865

MOSQUITO CONTROL

MUNICIPAL ABATEMENT PROGRAMMES: 1975

LONDON
MARA TOWNSHIP
WALLACEBURG
ORILLIA

HAZARDOUS CONTAMINANTS
COORDINATION BRANCH
135 ST. CLAIR AVENUE WEST
TORONTO, ONTARIO M4V 1P5

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Environment

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D.L. MacKenzie

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ABSTRACT

Reduction of biting incidence by nuisance mosquito populations has been found to be possible through many techniques: breeding destruction or habitat alteration (improvement of land drainage, filling of depression areas found to be larvae habitats and vegetation clearances around buildings where adults may rest), personal protection measures and pesticide application (larviciding, adulticiding or a combination of both). This report documents the approach, procedures, and details of mosquito abatement programmes implemented in four municipalities in Ontario during 1975. Each municipality modified and adapted a programme to suit local conditions. It is hoped that this information will be useful to other municipalities wishing to initiate a local mosquito abatement programme.

INTRODUCTION

In Ontario mosquitoes have been a source of discomfort to many residents during the spring and summer months. Demand for control of these pests has increased awareness of the complexity of the problem and various methods available for control. It is important to note that control does not mean elimination or eradication. However, it is possible to reduce mosquito populations to acceptable levels having considered such variables as species of mosquito present, available breeding habitat within and adjacent to the proposed area of control, physiography of the area and annual climatic conditions.

A report "Mosquito Control, Orillia 1974," by the Ontario Ministry of the Environment, Pesticides Control Section documented the approach taken by one municipality to control the spring Aedes spp. mosquito population in 1974. This report should continue to be used as a general reference for which this second report of 1975 activities is a follow-up. As is apparent in the following information, other municipalities had to diverge in their approach from the 1974 Orillia programme because of different requirements.

As information is gathered on how programmes can and should be modified to meet local conditions, a general guideline on mosquito control may be published.

In the interim, the following should be considered with these reports in the preparation and execution of an effective mosquito abatement programme:

1/ Fact Sheet: Guidelines for Municipal Mosquito Abatement Programmes (enclosed).,

2/ Controlling Mosquitoes and Black Flies in Ontario, 1976 (enclosed).

LONDON

(1) History

The City of London has recognized the need to carry out a mosquito control programme for many years. This city encompasses 66 square miles on the north and south branches of the Thames River; the present population is 237,000. While there are no extensive areas of swamp or marshy terrain, there are a large number of scattered small ponds and depresssion areas, particularly in the south and southwest sections of the city (Note Figures #2 and #3).

In 1953 the city council authorized establishment of a mosquito control programme for a then much smaller area; assistance was provided by Dr. A.W.A. Brown and Dr. W.W. Judd of the University of Western Ontario. Control at that time was application of DDT and fuel oil through a Tifa SF 50 Model Fogging machine as a larvicide and adulticide in the spring of the year.

In 1961 and 1962, the programme was updated and expanded; emphasis was placed on the use of small portable misting machines (Fontan sprayers) for larviciding. In 1967 the use of DDT was discontinued and malathion was substituted.

Emphasis on mosquito abatement until late 1974 was use of malathion as an adulticide with some larviciding. After contact was made with the Pesticides Control Section late in 1974, a review of the existing programme was made in light of newer information on mosquito ecology and control. More emphasis was placed on larval control with some

supplementary fogging and the greatest priority placed on surveillance of breeding sites of all three groups of mosquitoes: spring Aedes spp., summer Aedes spp., and permanent water Culex sp. The latter was included mid-summer when evidence for association of this species with St. Louis encephalitis appeared. Permanent ponded water in some of the construction sites (Figures #2 and #3) was found to be particularly good breeding sites for Culex spp.

(2) Education, Training and Licencing

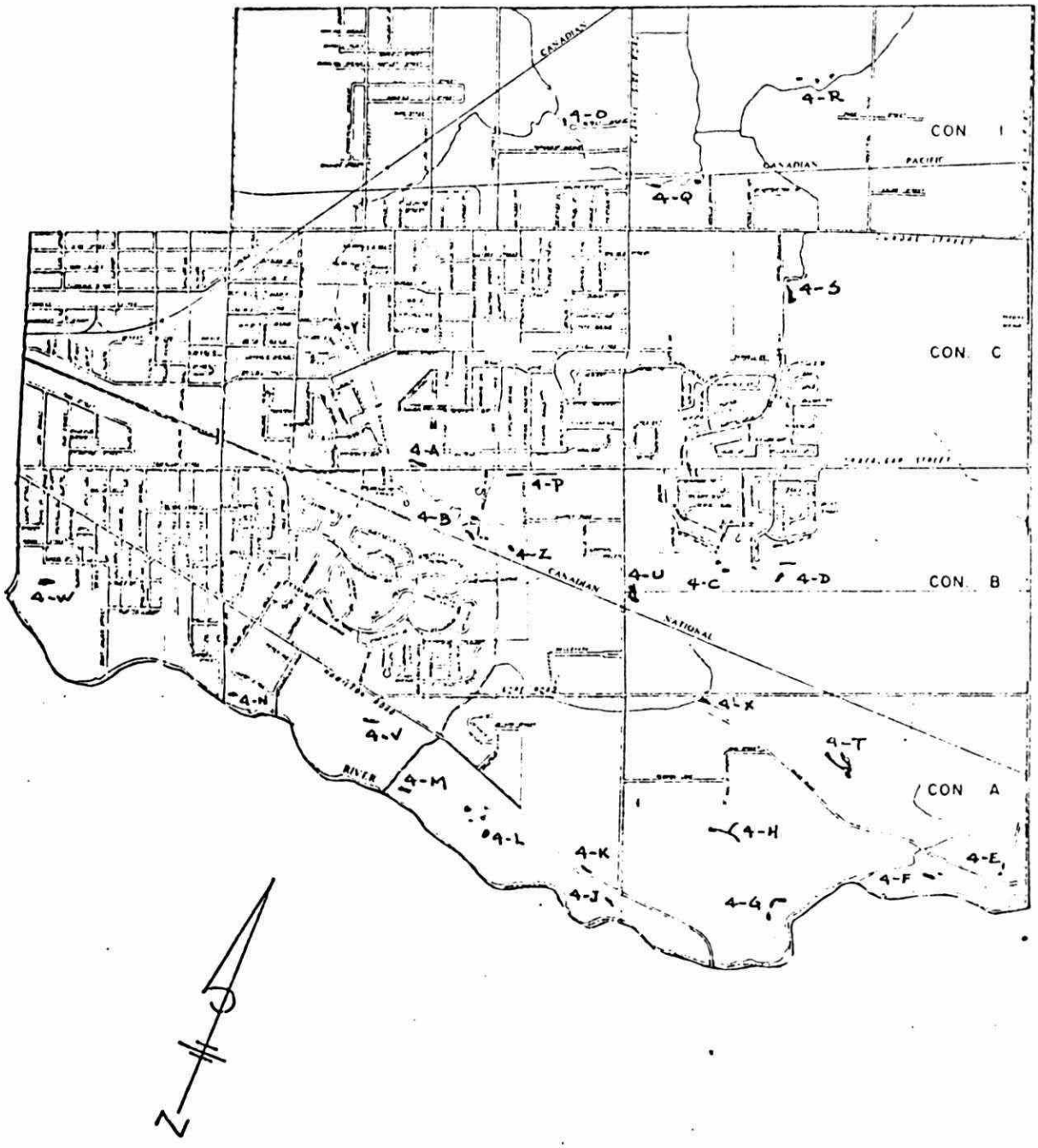
Staff originally obtained exterminators licences (Class 3 Land) from the Pesticides Control Service, Ontario Department of Health in 1965; therefore, re-examination for use of insecticides for mosquito adulticiding was not necessary. Updated information on registered pesticides and methods of application were investigated however to modify outmoded models. In addition, an exterminators licence for use of a mosquito larvicide (endorsed Water Class 10) was requested from the Pesticides Control Section, Ministry of the Environment, and successfully completed. Part of the pre-examination training course involved actual inspection in the field for practical aspects of larval surveillance.

(3) Mapping and Monitoring of Breeding Sites

Over the years, as a result of field work in mosquito control, a considerable amount of knowledge had been gathered on known trouble areas within the city. In 1975, a new set of maps was prepared by the Sanitation

CITY OF LONDON
MOSQUITO CONTROL PROGRAMME
MOSQUITO SURVEILLANCE AREAS
AREA 4 1975

Figure 1



Division of the City Engineer's Department showing all permanent and temporary ponds, pools, swamps, and ditches that are breeding sources for mosquitoes. Existing maps of the seven election polling divisions were used to subdivide the area into workable units and each infested pool marked and numbered for easy identification and reference. The new maps (for example, see Figure #1) were judged to be valuable from two aspects; they provided excellent reference for crews working on larval surveillance and served as a record for all treatments and checks.

A total of 38.5 acres of surface water within a total land area of 150 acres was kept under surveillance. Locations of the ponded water have been indicated on Figure #2 and Figure #3. Figure #4 shows an example record sheet where larvae populations were noted and monitored.

(4) Spring Larviciding

(a) Materials Used

Abate 4E emulsifiable concentrate was selected as the larvicide. It was applied by Fontan motorized backpack mist sprayers (three in continuous use: one per crew member plus one on standby).

(b) Calibration of Equipment

The Knapsack Misting Machines each contain 2.5 Imperial gallon liquid per tankful. Under normal walking conditions (determined using only water), an operator can spray 0.5 acres

Figure 2

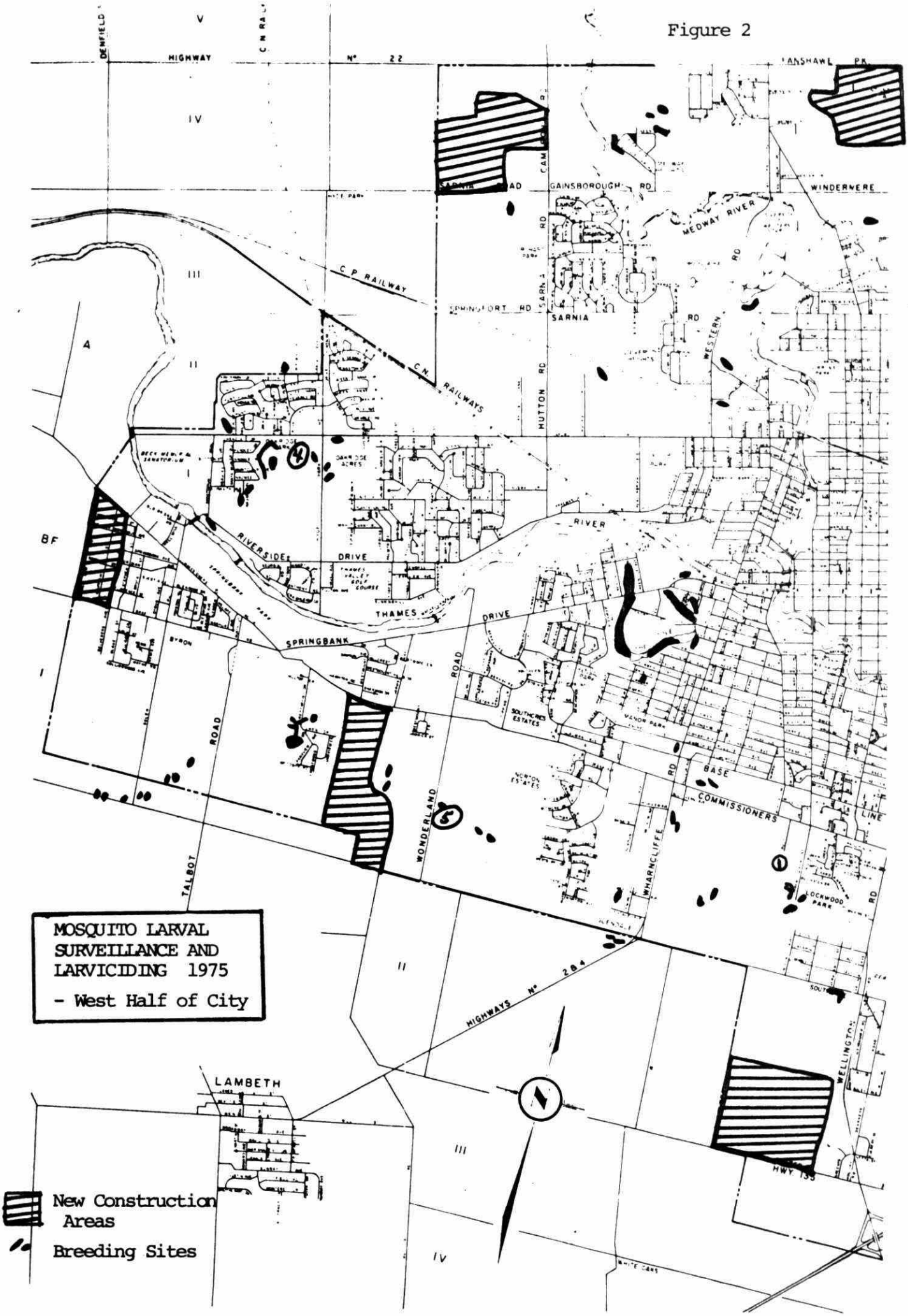
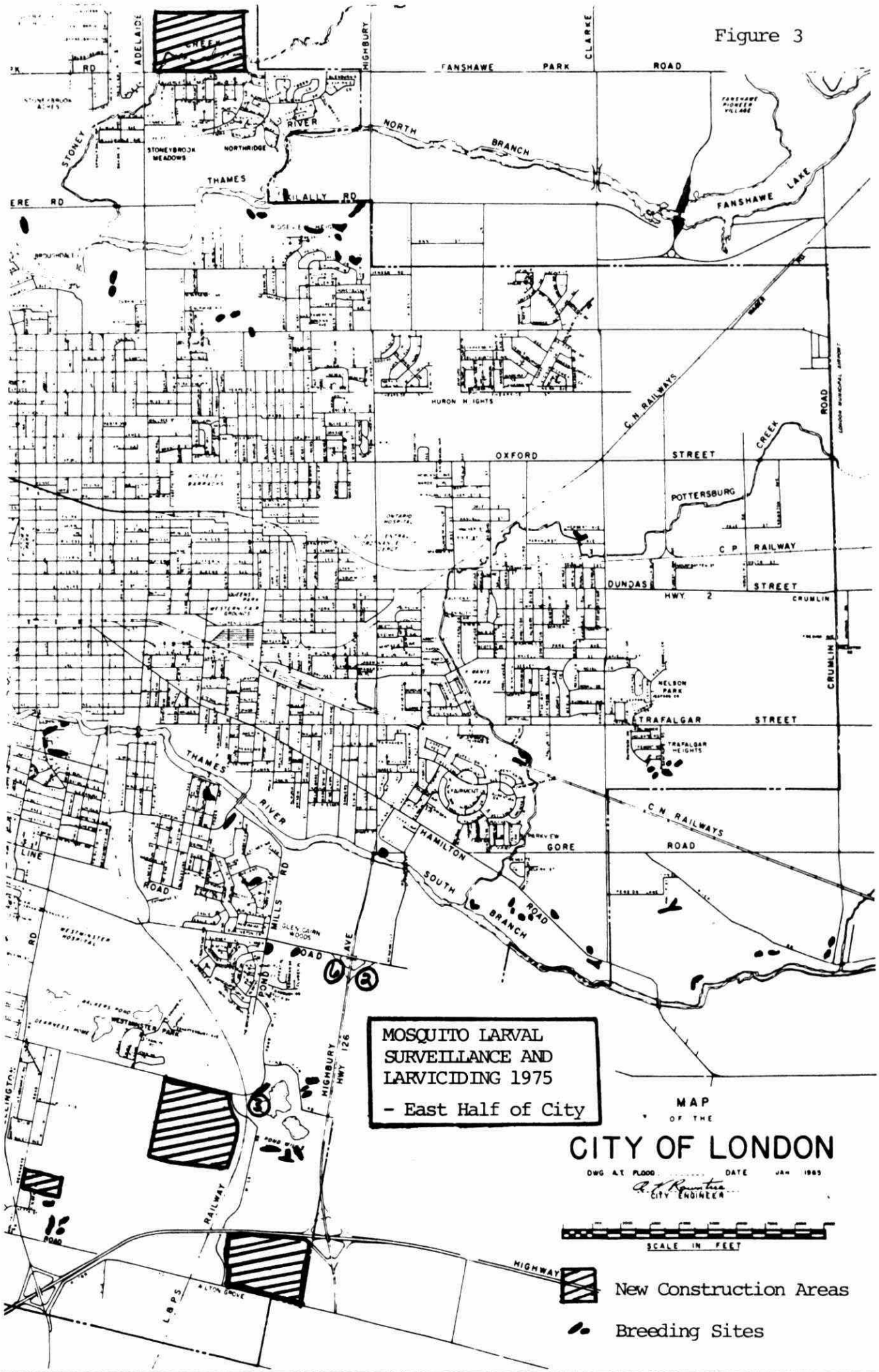

MOSQUITO LARVAL SURVEILLANCE AND LARVICIDING 1975
- West Half of City
New Construction Areas
Breeding Sites
HIGHWAY
C P RAILWAY
C N RAILWAYS
SARNIA
GAINSBOROUGH RD
WINDERMERE
MEDWAY RIVER
SPRINGBANK
THAMES
DRIVE
RIVERSIDE
RIVER
TALBOT
ROAD
WONDERLAND
BASE
COMMISSIONERS
LINE
HUTTON RD
WESTERN
RD
LAMBETH
HIGHWAYS N° 2 & 4
WELLINGTON
HWY 133
LOCKWOOD PARK
WHARNCLIFFE
SOUTHCREST ESTATES
VENOR PARK
BYRON
N

Figure 3


FANSHAWE PARK ROAD
ADELAIDE
HIGHBURY
CLARKE
STONEY CREEK
STONEYBROOK MEADOWS
NORTHRIDGE
THAMES RIVER
NORTH BRANCH
KILALLY RD
FANSHAWE LAKE
HURON HEIGHTS
C.N. RAILWAYS
OXFORD STREET
POTTERSBURG CREEK
C.P. RAILWAY
DUNDAS STREET
HWY 2
CRUMLIN
NELSON PARK
TRAFALGAR STREET
TRAFALGAR HEIGHTS
THAMES RIVER
HAMILTON ROAD
GORE ROAD
SOUTH BRANCH
POND MILLS ROAD
HIGHBURY AVE
HWY 126
RAILWAY
HIGHWAY
L.P.S.
MOSQUITO LARVAL SURVEILLANCE AND LARVICIDING 1975
- East Half of City
MAP OF THE
CITY OF LONDON
DWG A.T. PL000
DATE JAN 1985
CITY ENGINEER
SCALE IN FEET
New Construction Areas
Breeding Sites

per tankful; machine output was calculated to be 3/4 gallons per minute or tankful over three minutes. Abate 4E is added to the tank at the rate of 1 fluid oz. product per 300 oz. water (tankful). Therefore, the maximum rate of application is 2 fl. oz. product per acre.

(c) Treatment Details

Monitoring of snowmelt pools for the spring Aedes species began in mid-April. Mosquito species found in these pools as larvae on April 28th were identified at the University of Guelph. In decreasing order of abundance they were: Aedes stimulans, Aedes canadensis, Aedes cinereus, and Aedes sticticus. Larviciding with Abate 4E commenced on May 8. Approximately 22.25 acres of the 38.5 acres of surface water under surveillance had to be treated; most of the breeding sites were less than ¼ acre in size. Figures #2 and #3 indicate areas where larvicides were applied. A total of 97 treatments were made (some locations were treated more than once as they were the sites of several generations of summer Aedes mosquitoes as well). Figure #5 is an example data sheet completed whenever a larvicide or adulticide was used.

(d) Efficacy

Post-treatment inspections were made to

Table 1

ABATE RESIDUES (ppm)

	Water	Sediment
Before Treatment	N.D. *	N.D. 54.4% water
Immediately Post-Treatment	0.016	(no sample taken)
24 Hours Post-Treatment	.001	N.D. 45.2% water
6 Days Post-Treatment	N.D.	N.D. 75.6% water

Abate 4E was applied with motorized knapsack sprayer on May 21, 1976.

* N.D. - not detectible

Limits of detection:

water 0.001 ppm

sediment 0.1 ppm

determine larval mortality. The Engineering Department was extremely pleased with the high degree of control achieved with use of the larvicide.

(e) Residues

One representative breeding site on Vicount Road in the city of London was monitored for Abate residues. Samples were submitted to the Provincial Pesticides Residue Testing Laboratory, Guelph; appreciation is extended to Dr. R. Frank for providing the analytical capability. The results are documented in Table #1. The pool is located by #5 on Figure #2 in a semi-shaded woodland area.

(5) Summer Larviciding

Roadside ditches susceptible to flooding after periods of heavy rainfall were checked for evidence of mosquito larvae after every rainfall of greater than one inch, and infestations were treated with larvicide accordingly. Aedes dorsalis were found on June 12th in third and fourth instars in a grassy depression of the junctions of Highway 126 and Commissioners Road (#6 in Figure #3); similar type habitats were then monitored over the summer for this species.

Mosquito species (larvae and adults) were collected from various sites over the summer for identification by Dr. R.E. Wright at the University of Guelph. Results are tabulated in Table 2.

MOSQUITO COLLECTION: CITY OF LONDON, 1975

Table 2

DATE	STAGE	LOCATION	SPECIES	NUMBER
August 13-15	Adults*	Hyland Golf Course (#1, Figure 2)	Culex restuans	2
			Culex sp.	1
August 19	Adults	Highway 126 and Commissioners Road (#2, Figure 3)	Aedes dorsalis	8
			A. vexans	2
			Culex restuans	7
August 20	Adults	Highway 126 and Commissioners Road (#2, Figure 3)	A. dorsalis	3
			A. vexans	1
			Culex restuans	12
August 28	Larvae (4th instar)	Highway 126 and Commissioners Road	A. dorsalis	2
			A. vexans	2
			Anopheles earlei	1
			Culex pipiens	
August 28	Larvae (4th instar)	Pond Mills Road (#3, Figure 3)	Aedes vexans	1
September 11	Adults	Byron bog	A. vexans	47
			A. trivittatus	8
			Culiseta impatiens	2
			Culiseta melanura	1
			Anopheles Walkeri	1
			Culex sp.	1

* Adults were caught using CDC Miniature light traps with dry ice.

Due to the extension of warm weather and a series of heavy rainfalls in August which carried into September, the field crews continued to monitor for presence of larvae until November 4th. The last larvicide application was made on October 13th.

(6) Adulticiding

Thermal fogging with malathion was carried out only where complaints were received and there were sufficient adult mosquitoes to warrant treatment. Due to problems with an old Tifa fogger, only portable swing foggers (two with one on standby) were used until a new London fog 500 truck-mounted machine was obtained on July 15th. Malthane concentrate was used through the portable swing fogs.

A solution of Riddex Mal-Fog was mixed 3 quarts product to 5 gallons No. #1 fuel oil and put through the London thermal fogger at a rate of approximately 1 gallon of solution per acre; this naturally varied with type of terrain, access and truck speed.

Summary

The Mosquito Abatement Programme consisted of four staff:

	POSITION	DEPARTMENT	EXTERMINATORS LICENCE HELD
J. Coleman	Pest Control Operator	Works	Class 3 land
J. Rennie	Mosquito Crew Chief	Works	Class 3 land
P. Trocchi	Crew Driver & Labourer	Works	Nil
G. Rodgers	Engineering Aide 1	Engineering	Class 3 land Class 3 water

Figure 4

CITY OF LONDON - ENGINEER'S DEPARTMENT
SANITATION DIVISION
MOSQUITO LARVA SURVEILLANCE

75-313

OPERATOR: _____ DATE: _____

	Pond No.	LARVA				Pupae	Remarks
		Nil	Light	Medium	Heavy		
KNOWN AREAS							
NEW AREAS							

* NOTE: Give description of New Areas above.

Figure 5

70-325
File: 560/I/3,__

CITY OF LONDON - ENGINEER'S DEPARTMENT
SANITATION DIVISION
MOSQUITO CONTROL SPRAYING

Location ..... Date .....

Operator ..... Equipment Used .....

Time of Spraying Start ..... Finish .....

1. Larvicide Used: .....
2. Amount Used: .....
3. Concentration of Mix: .....
4. Area Covered (acres or sq. yds.): .....
5. Weather Conditions: .....
6. Air Temperature: .....
7. Wind Velocity Light ..... Medium ..... Strong .....
8. Wind Direction: .....
9. Water Temperature: .....
10. General Description of Area Sprayed (bush, swamp, etc.) .....

.....

.....

.....

.....

11. General Remarks: .....

.....

.....

.....

.....

/pt
May, 1970.

The former three reported to Mr. Rodgers for matters involving mode of operation for the mosquito programme and to the General Foreman of the Works Department for other duties such as rodent control and litter box maintenance. Thus the working unit could be kept together twelve months of the year and provided continuity in the mosquito abatement programme from year to year. The Engineering Aide 1 is responsible for revising programme approach, preparing budgets and recommending and purchasing equipment, safety supplies and pesticides.

London's 1975 Budget for Mosquito Control April to September, was $6,680.00. An additional $2,000.00 was approved to continue surveillance and treatment past September 1, when St. Louis encephalitis was reported in southwestern Ontario and the control programme was extended into the fall.

A breakdown of costs is as follows:

	Equipment	Labour Cost
April	$ 6.80 *	$ 130.20
May	39.25 *	708.23
June	180.48	1,150.02
July	161.20	1,070.26
August	139.70	1,141.43
September	243.10	1,756.38
October	100.50	253.65
	$ 871.03	$ 6,210.17

* Equipment costs in spring includes only a $1.20/hr depreciation for the truck. There is no hourly depreciation rate for misting machines.

Total cost for materials was $607.78 (not including safety equipment or personnel uniforms).

The balance of budget ($991.00) went to salaries, licences and miscellaneous costs.

A total of one gallon Abate 4E, 5 gallons Malthane concentrate and 3 gallons of Riddex Mal-Fog were used in the 1975 season.

The following table gives a breakdown of hours devoted to mosquito larviciding and adulticiding on a per month basis:

MONTH	LARVICIDING	ADULTICIDING
May	4.0 hours	
June	2.5 hours	15.75 hours
July	3.5 hours	14.25 hours
August	5.5 hours	5.5 hours
September	16.75 hours	3.0 hours
October	6.75 hours	2.5 hours

(Note that the above times do not include travelling time or time to set up equipment and mix solutions).

MARA TOWNSHIP

(1) History

Mara Township has recorded a high incidence of nuisance mosquitoes for many years and has attempted various methods of control over the past thirty years to alleviate the problem. Poor natural drainage into Lake Simcoe combined with establishment of a populated sand beach area prohibits much of the spring snow-melt from leaving the area. The swampland in Mara Township comprises four types: woodland snow-melt pools (which may dry up if weather permits); permanent deciduous woodland bog; cedar swamps and cattail swamps. Total bog area is in excess of 3800 acres. Each of these habitats may be a breeding source for specific species of mosquitoes, many of which may be a nuisance to humans. Abatement procedures this year centered around treatment of the temporary woodland snow-melt pools (early May for spring Aedes) with monitoring of larval incidence in the other types of habitats for summer species of Aedes, Culex, Culiseta, and Coquillettidae to determine whether expansion of the abatement programme was necessary.

(2) Training and Licencing

Township personnel made application for a land Class 10 (endorsed for mosquito adulticiding) and a water Class 3 (endorsed for mosquito larviciding) and an Operator's Class 4 as required under the Pesticides Act, 1973. Len Dobbs of Caledon Helicopter was given special permission to apply larvicide as a holder of a Class 7 and 8 land

exterminator's licence; he will shortly be examined for a water Class 3 endorsed licence. An application for an aquatic nuisance control permit was also submitted by the township and approved.

(3) Mapping and Monitoring of Breeding Sites

An extensive survey had been executed in 1971 to determine probable mosquito breeding sites; the estimated total area of potential breeding sites was 3,800 acres.

Specific locations were checked for presence and identification of mosquito larvae on May 5th by Dr. R.E. Wright of the University of Guelph. Sites marked on Figure #1 contained the following species of larvae:

1. Aedes stimulans
   Aedes fitchii
   Aedes cinereus
   Aedes intrudens
   Aedes implacatus
   — 1st and 2nd instar

2. Aedes stimulans
   Aedes fitchii
   — 1st and 2nd instar

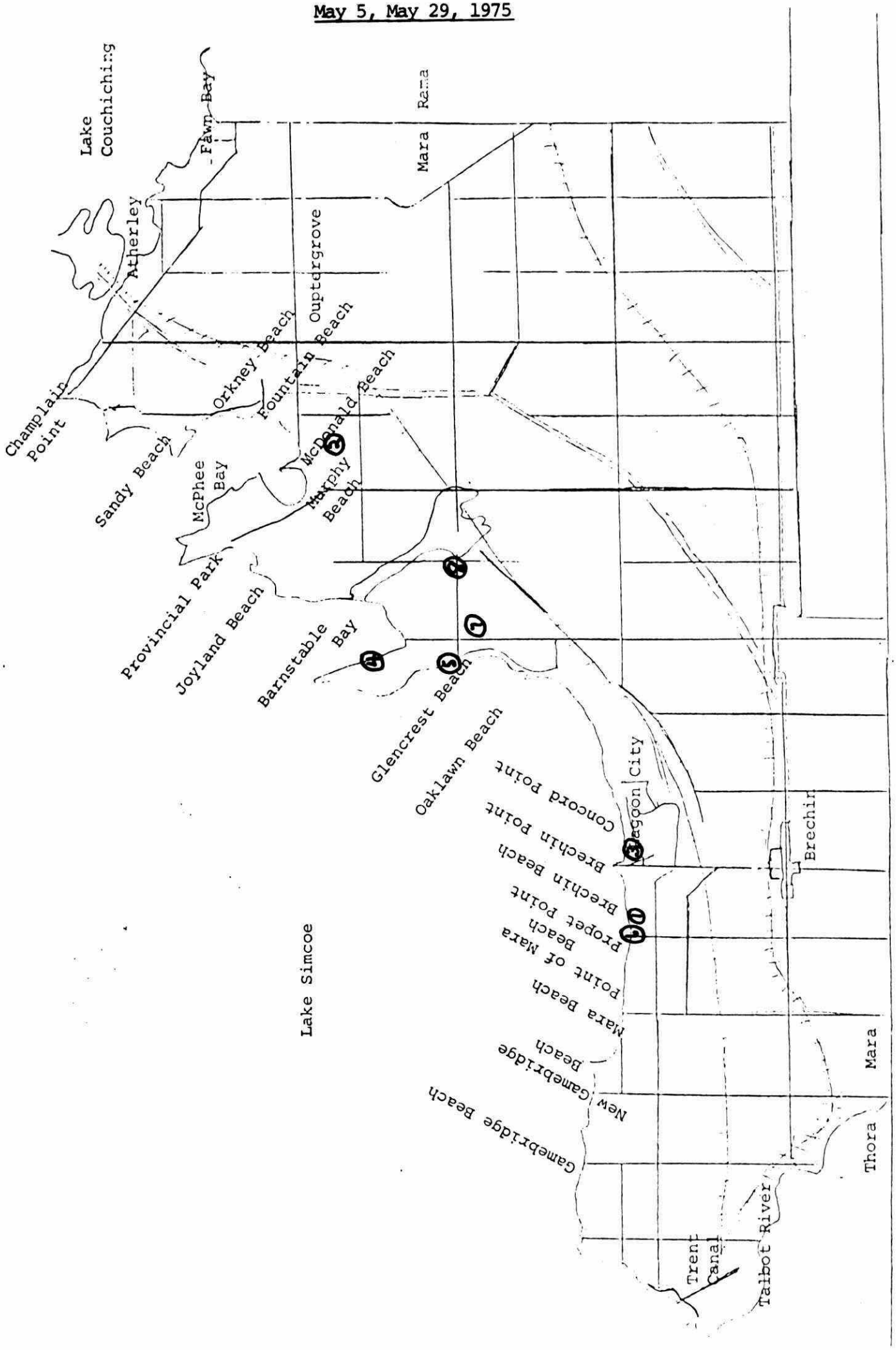
Locations marked on Figure #2 were checked by Ministry of the Environment staff on May 8th for abundance of mosquito larvae; habitat descriptions of the snow-melt pools were also noted (see table #1).

Adult collection of mosquitoes was made at various locations on May 29th by staff of the University of Guelph for identification. Refer to Figure #1 for location of trapped adults listed in order by decreasing numbers.

Figure 1

SAMPLING SITES FOR SPRING AEDES SP.

May 5, May 29, 1975



3. Aedes stimulans
Aedes abserratus - punctor

4. Aedes stimulans
Aedes fitchii

5. Aedes fitchii
Aedes stimulans
Aedes abserratus - punctor

6. Aedes fitchii
Aedes abserratus - punctor

7. Aedes fitchii
Aedes stimulans
Aedes cinereus

8. Aedes stimulans
Aedes cinereus

Summer weather around Mara was extremely dry. Surveying of pools after one rainstorm produced no apparent larvae. Attempts at running a CDC light trap in late August failed; so there was no monitoring of summer mosquito populations.

TABLE 1

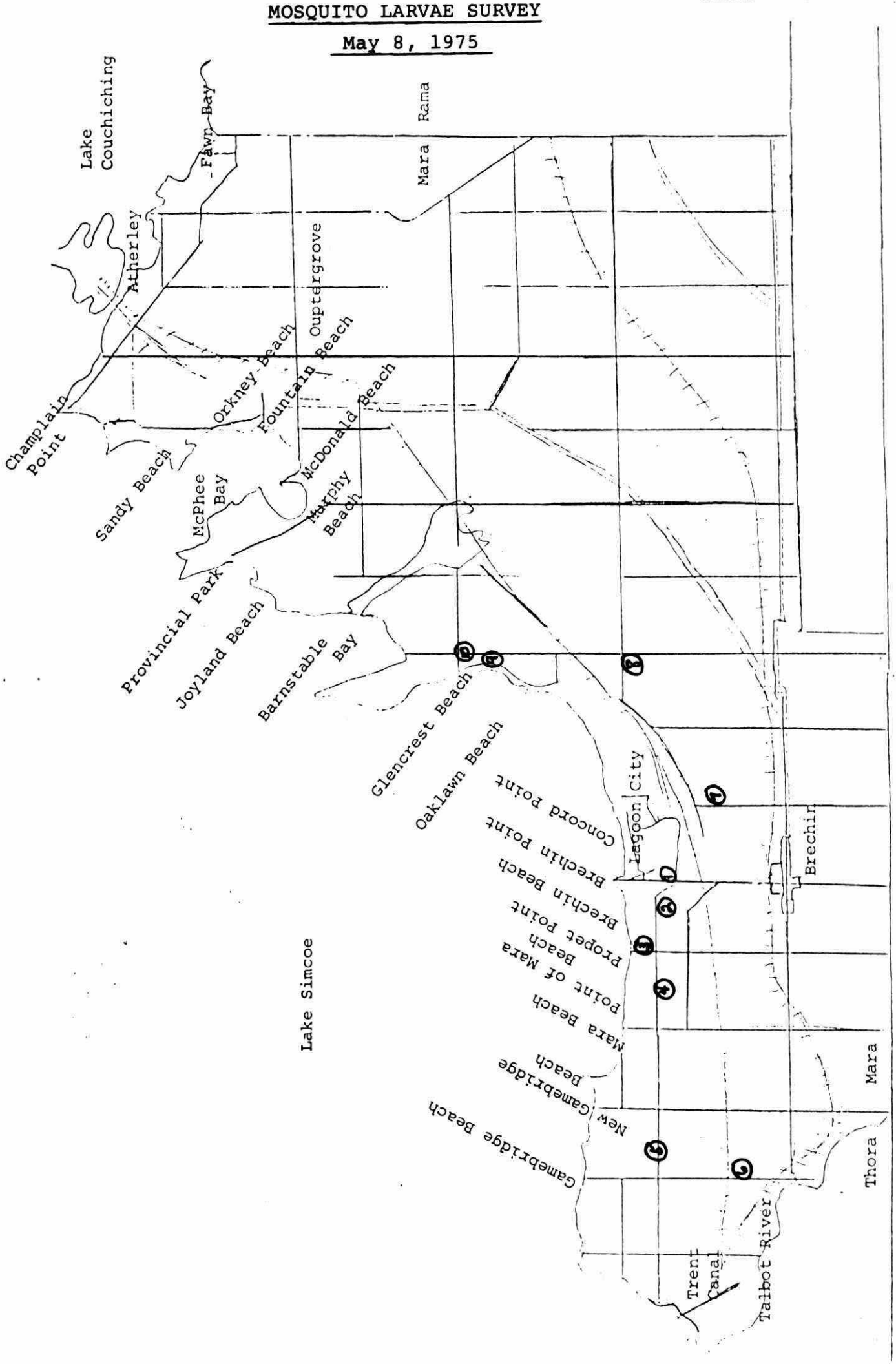
Staff of the Ministry of the Environment conducted a preliminary survey of mosquito larvae density relative to habitat type in the area May 8th to assist in determining optimum time for spraying. Refer to Figure #2 for location of the following sites:

	Type of Pool	Density of Mosquito Larvae
1.	Mature deciduous woodland swamp	15-20 larvae/dip, 2nd-3rd instar
2.	Forest and bush bog, duckweed, cattails	None
3.	Roadside grassland ditch along residential area	25+/dip
4.	Low grassland near residences; bloom of Spirogyra sp.	15/dip
5.	Cedar swamp; mixed bush with cattail swamps	A few 3rd instar
6.	Mixed bush	None
7.	Permanent cattail swamp and bush bog	None
8.	Permanent woodland swamp (very murky water)	None
9, 10	Permanent woodland swamp near residential area (clear water, deciduous leaf matter).	50+/dip; 1st and 2nd instar

Figure 2

MOSQUITO LARVAE SURVEY

May 8, 1975



(4) SPRING LARVICIDING

(a) Materials Used:

Abate 2G (a combination of two mesh sizes) was selected as the larvicide to be applied by helicopter at the rate of 3 pounds product per acre over 2,340 acres (Figure #4). Caledon Helicopter (Len Dobbs) was contracted for the work. Marginal areas, not treated from the air, were covered with ground application with a granular seeder borrowed from the City of Orillia (Figure #3); a total of 10 pounds product was used as spot treatments.

(b) Calibration of Helicopter Spray Equipment

The helicopter engine powers a hydraulic blower connected to 2 five hundred pound capacity feeder tanks. The blower produced an air blast equivalent to 120-140 m.p.h. to drive out the granular material which fed into the airstream by an augar which turns at a constant rate (r.p.m.). The r.p.m. of the augar and velocity of the airstream are constant; the volume of pesticide is regulated by a valve between the feeder tank and the augar. The air blast is reported to give a total swath width of 100 feet. Air turbulence from the helicopter plays only a small part in influencing the dispersal pattern of the granular when the helicopter is airborne (forward velocity 50 m.p.h.).

To calibrate the equipment a specified weight (50 pounds) of Abate 2G was emptied into each of the side tanks. Burlap bags were held by hand over the air blast outflow. Once the hydraulic blower was activated and

output was clocked to determine output in pounds per minute. It took two trials to obtain the 30 lb/minute rate with further fine adjustments made following a few flight trials (note table #2 for further details).

Flight altitude was not considered to have great significance in actual rate of deposition. The helicopter was flown at a 50-foot altitude in open areas but 20 feet above tree tops in the forested areas. Wind was a consideration which was carefully watched; application occurred only at dusk or dawn when winds were neglibible (<2 m.p.h.).

Difficulty did arise in spotting breeding sites through the brush areas to obtain uniform coverage using visual coordinates from the air. The pilot included some non-breeding sites in the application. Since the lower rate of Abate 2G (3 pounds/acre) was used, an effective concentration of the larvicide may not have penetrated the wooded canopy (due to ricochetting and powdering) in every instance.

(c) Actual Treatment Details:

The helicopter and crew arrived at the site on May 13th. Calibration was made; actual flight was grounded because of high winds. May 14th treatment started at dawn and ceased at 10:00 A.M. due to unfavourable weather conditions that evening permitted additional hour's work. On May 15th spraying started at 6:00 A.M. but was grounded by 9:45 A.M. No further treatment was possible until the

TABLE 2

CALCULATION OF RATE OF OUTPUT (LB/MIN) FROM THE HELICOPTER

The desired rate of Abate to be put down was 3 pounds per acre. The results of the calculation (see details below) indicated that the rate of output should be 30 pounds per minute given that the swath width is 100 feet and the helicopter is travelling with a ground-speed of 50 m.p.h.

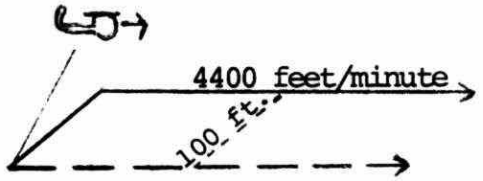
Detailed Calculation:

#1. 1 mile = 5280 feet

$$50 \frac{\text{miles}}{\text{hr.}} = \frac{50 \text{ miles}}{60 \text{ minutes}} = \frac{50 \text{ miles} \times 5280 \text{ feet/mile}}{60 \text{ minutes}}$$

therefore, 50 m.p.h. = 4400 feet/minute.

#2 Assuming the swath width (i.e., width of area of deposition) to be 100 feet:



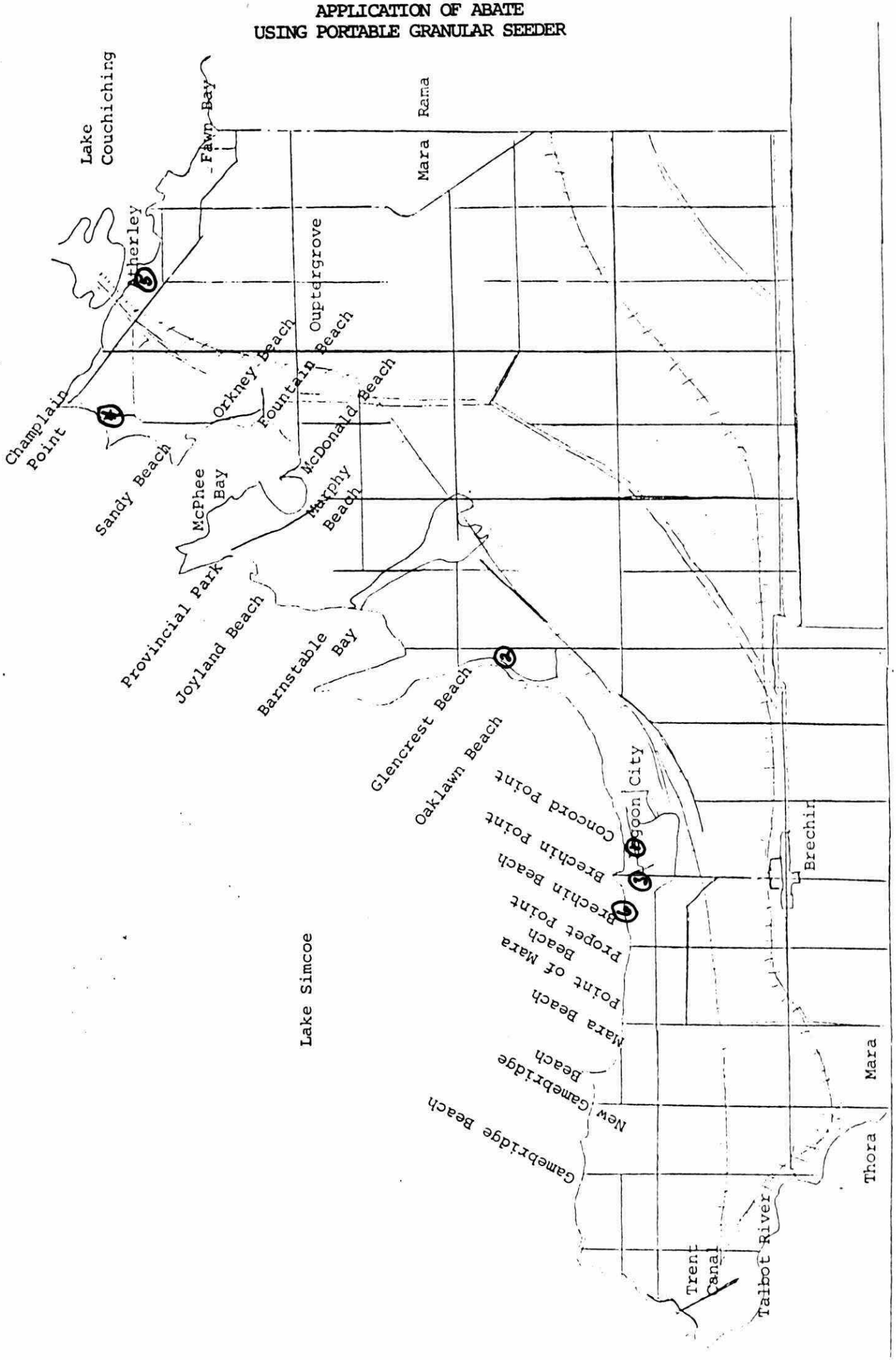
4400 feet/minute x 100 feet = 440,000 square feet/minute
= 10 x 44,000 square feet/minute
= 10 x 1 acre/minute
= 10 acres/minute

#3 Since the helicopter sprays 10 acres/minute and the desired rate is 3 pounds/acre, then:

the application rate = 10 acres/minute x 3 pounds/acre
= 30 pounds/minute.

Figure 3

SITES (6) OF GROUND
APPLICATION OF ABATE
USING PORTABLE GRANULAR SEEDER



evening of May 17th when the remainder of the designated areas were treated. Larvicide was applied to the following areas as designated in Figure #4:

Date	lbs Abate 2G	Area	Acres
Wednesday, May 14	1800	A,B,C	600
	1600	D,E	534
Thursday, May 15	400	F	134
	400	G,H,I	134
	400	J,K	134
	400	L,M	134
	400	N,P	134
	400	Q	134
	400	R	134
	400	A (to cover	134
	400	A,D areas missed previously)	134
	7000 pounds		2340 acres

Areas poorly covered by air were treated by hand with portable seeder (see Figure #3).

Previously, one aerial application of liquid Abate 4E had been made by a helicopter (Bell 476-2, 40 m.p.h., altitude 100 feet) over 3800 acres between May 7-15th, 1971. Figure #5 shows the area treated at that time. Areas around the Talbot River and eastern expansion of section A (1975) were not treated in 1975 because they were not found to be breeding sites for spring Aedes sp.

(d) Pesticide Monitoring and Residues

The Ministry attempted to ascertain whether the granules applied by air over densely wooded deciduous bush would reach the pools even though spring foliage had not yet come out. Following studies by D.J. Sutherland

Figure 4

SITES OF AERIAL APPLICATION OF GRANULAR LARVICIDE

May 13-17, 1975

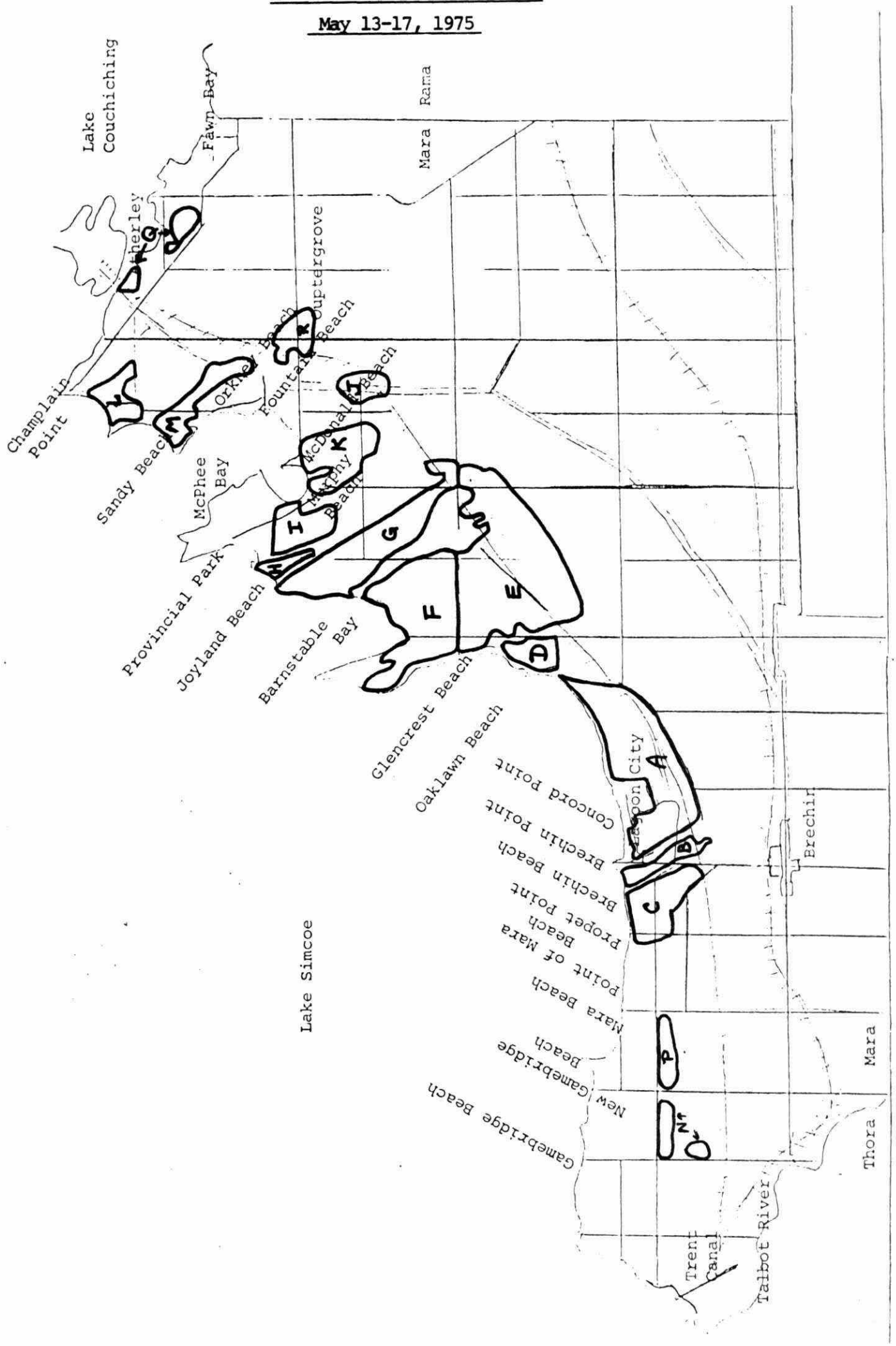
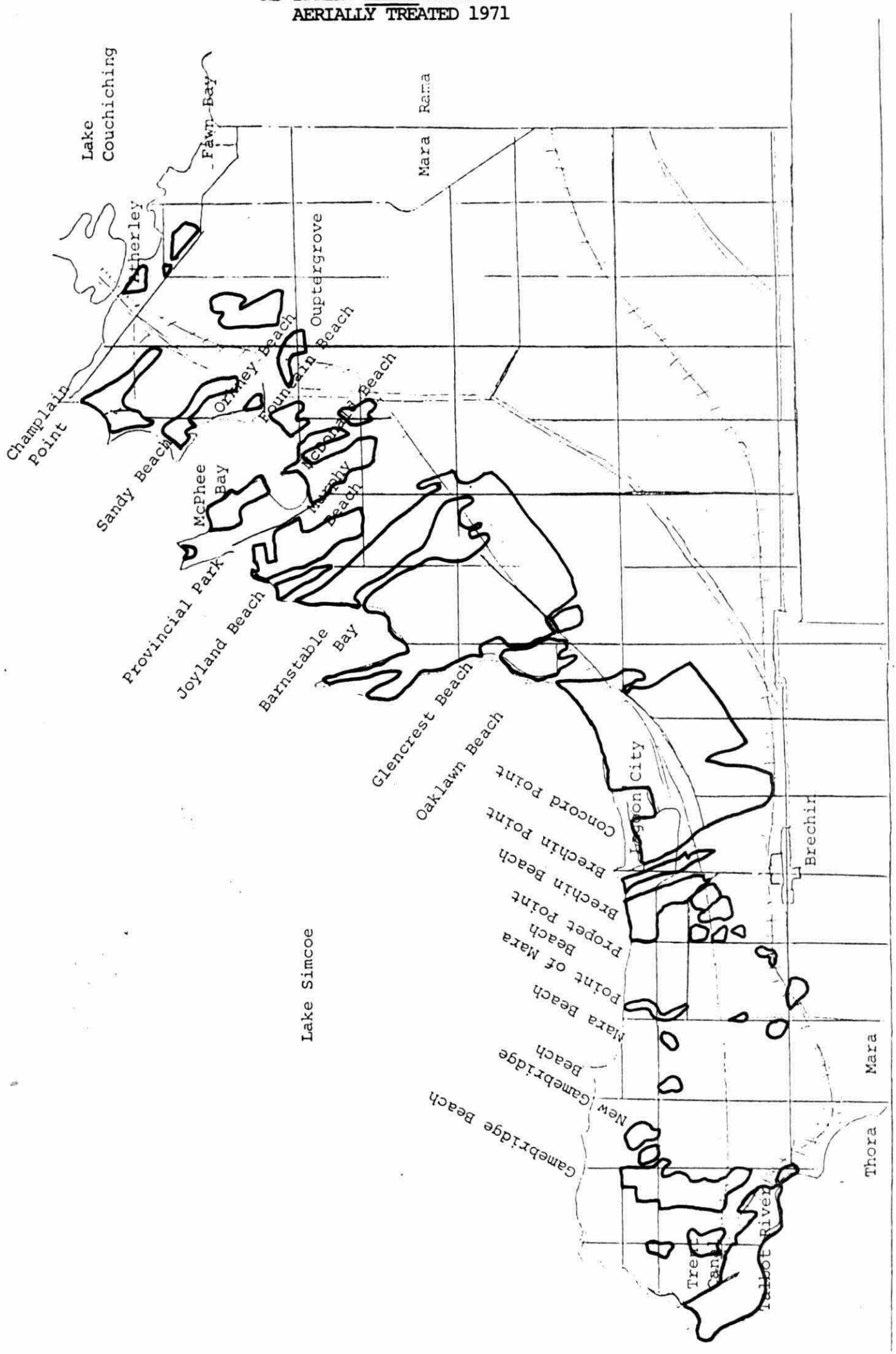


Figure 5

AREAS PREVIOUSLY DESIGNATED AS SPRING AEDES HABITAT AND AERIALLY TREATED 1971



SITE	LOCATION	MAY 12, 1975	MAY 15, 1975		MAY 28, 1975
		* Pre-treatment larvae numbers	** Post-treatment larvae numbers	Amount of visible chemical	Adult mosquito biting levels
1	Brechin Beach Road	110-120/dip	6-12 pupae/dip	- no granules - treated May 14th	++
2	Concession 4	10-15/dip	15-18 pupae/dip	- no granules - treated May 14th	++
3	Concession 7	150-170/dip	50 larvae/dip	- 5 granules/sq. ft. - treated May 14th	++
4	Southview Cove	30-40/dip	15-20 larvae/dip	- no granules - treated May 14th	++
5	Side Road 20	50-60/dip	40-50 larvae/dip	- no granules - treated May 14th	++
6	Concession 3	20-25/dip	10-15 pupae/dip	- 6 granules/sq. ft. - treated May 14th	+++
7	Lagoon Gate Road	10-15/dip	2-4 pupae/dip	- 2 granules/sq. ft. - treated May 14th	+
8	McGuiness Point	15-20/dip	0-4 pupae/dip	- 8 granules/sq. ft. - treated early May 15th	+++

* Samples taken May 12 between 10:00 A.M. and 2:00 P.M., weather - sunny.

** Samples taken May 15 between 7:30 A.M. and 9:00 A.M., weather - overcast, occasional rain
Lower counts may be due to time of sampling on May 15.

SCALE:
+ = low
++ = moderate
+++ = very high

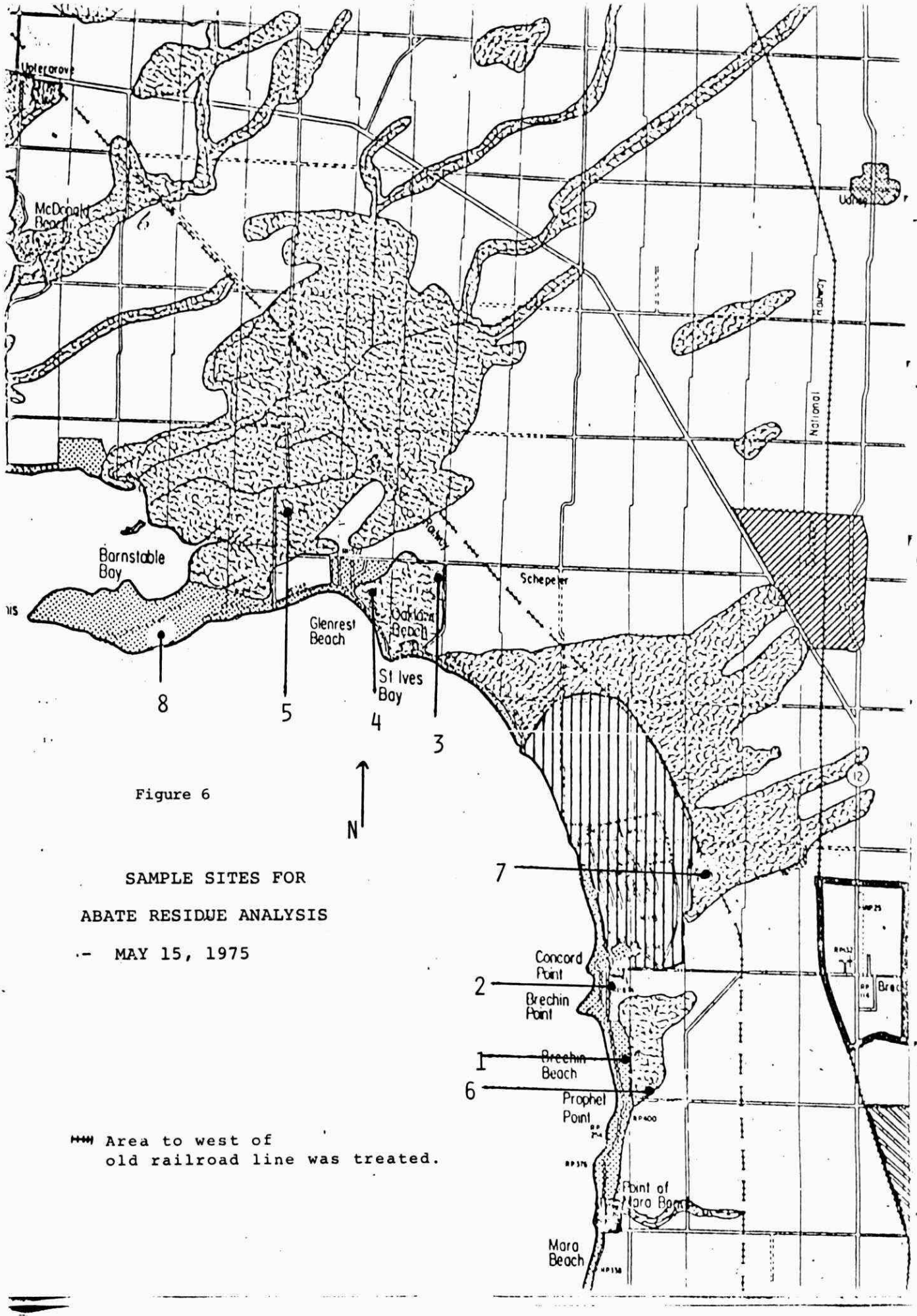


Figure 6

SAMPLE SITES FOR

ABATE RESIDUE ANALYSIS

- MAY 15, 1975

~~Area~~ Area to west of old railroad line was treated.

(1974), a number of 18 inch x 12 inch aluminum pans were distributed in selected locations throughout the treatment site to collect the granules. The number of granules per pan could then be extrapolated to calculate the density of granules per square foot (and lbs. Abate/acre).

A fine layer of soil was put in the bottom of each of the pans in order that the granules would not likely bounce or be blown out of the pans. Use of the pans proved futile in that the granules only appeared in two of the eight locations although granules were more obvious in the pools. Therefore, records were made on frequency of the granules actually visible in the larvae pools. Sites listed can be located in Figure #6.

Some of the difficulty in obtaining data on uniform distribution of granules on the ground may be accounted for in the following way: Each feeder tank on the helicopter has a 500 pound capacity; at the first onset of spraying with full tanks, helicopter vibration may cause some horizontal density layering of the granules so that the smaller, more compact particles are released into the airstream first. Areas treated late in the flight programme when more of the larger, more uniform-sized particles may be applied, definitely showed more observable granules at ground level. In addition, clay compaction of the granules used did not well withstand friction of application; much of the larvicide was powdered upon release from the helicopter and could be observed to drift off target.

As a follow-up on presence/absence of Abate granules, water and mud samples were collected from

several sites post-treatment to determine residue persistence. Analyses were provided by Dr. R. Frank, Provincial Pesticides Residue Testing Laboratory. Refer to Figure #6 for site locations.

LOCATION	SITE NO.	ELAPSED TIME	ABATE RESIDUE	
			Water (ppm)	Sediment (ppm)
May 14, 1975				
Concession 3	6	2.5 hours	0.005	---
Lagoon Gate Road	7	3.5 hours	N.D.	---
McGuinness Point	8	4.5 hours	0.006	---
May 15, 1975				
Concession 3	6	24 hours	0.002	---
Lagoon Gate Road	7	24 hours	N.D.	---
McGuinness Point	8	24 hours	N.D.	---
May 28, 1975				
Concession 3	6	14 days	trace-N.D.	N.D.
Lagoon Gate Road	7	14 days	0.003-0.005	0.24
McGuinness Point	8	14 days	0.001-trace	trace
Concession 4	2	14 days	0.001-trace	6.6

Note: Pre-treatment residue samples were not taken.

N.D. - not detectable

Limit of detection: in water - 0.001 ppm
in sediment - 0.1 ppm

A possible explanation for late evidence for Abate residues in the area of Lagoon Gate Road was that this area was part of the spot treatments where ground application with a granular seeder was made May 17th. Overtreatment may have occurred.

(5) Mosquito Adulticiding

Due to the rapid rate of development of the spring Aedes spp. and possible escape of treatment of some of the mosquito breeding sites, some adulticiding was undertaken. Previously a warm fog of Mal-Thane (a malathion-lethane mixture from Abell Waco) had been put through a Tifa fogger. Two portable swing foggers had also been used around hedges in urban areas.

Attempts to repair the Tifa in the spring proved futile so an ultra-low volume machine, Micro Gen (Model L52-15, Serial No. #5052) was purchased, with two 45 gallon drums of a pyrethrin (3%) piperonyl butoxide (6%) insecticide (PCP #11855) formulated by Abell Waco Ltd. The machine was truck-mounted.

One member of staff from Mara Township made application for a land Class 10 exterminators licence endorsed for use of the ULV machine. In the interim a special permit (Figure #7) was issued to permit experimental use. Dates and man-hours for the fogging operation are listed as follows:

June 27	5 hours
28	5 hours
30	4 hours
July 1	6 hours
3	5 hours
9	3 hours
11	6 hours
12	6 hours
22	1.5 hours
24	1.5 hours
26	3 hours
29	3 hours
30	3 hours
Aug 11	3 hours
Sept 3	5 hours
	55.5 hours

Ministry of the Environment

Pesticides Control Section

Form 10

Figure 7
The Pesticides Act, 1973

Application for a Permit to purchase and use a Pesticide

PLEASE PRINT CLEARLY

I, (name) Frank Mangan Telephone (home) (bus.)

of (home address) Apt. No. Number and Street City, Town, etc. POSTAL CODE

(business address) P.O. Box, R.R. No. Apt. No. Number and Street City, Town, etc. Township of Mara, Brechin, Ontario POSTAL CODE

apply for a permit to purchase and use:

NAME OF PESTICIDE	FORMULATION	ACTIVE INGREDIENT	CONCENTRATION	TOTAL QTY.
Pyrethrins 3.0% Piperonyl Butoxide 6.0%				

to be applied at MIX on CROP OR AREA TO BE TREATED

for the control of NAME OF PEST adult mosquitoes

on premises located at MAILING ADDRESS

LOT | CONC. | TOWNSHIP Mara | COUNTY, DISTRICT OR REGIONAL MUNICIPALITY

during the time period FROM July, 1975 TO August, 1975

using TYPE OF EQUIPMENT Micro-Gen Model LS2-15

I am licensed under The Pesticides Act, 1973 and regulations thereunder ☐ NO — ☐ YES

If "YES", I hold a

	CLASS	NUMBER
LAND EXTERMINATOR'S LICENCE		
STRUCTURAL EXTERMINATOR'S LICENCE		
WATER EXTERMINATOR'S LICENCE		
OPERATOR'S LICENCE		

Date 19 Signature of Applicant

DO NOT COMPLETE – FOR MINISTRY USE ONLY

Permit No. L-U-3-004-75

Permission is hereby granted under the Pesticides Act, 1973 and the Regulations to purchase and use a pesticide

☒ in accordance with the conditions as detailed in the above appliction
or
☐ with the following amendment(s)

Trial application

Date July 9 19 75 Signature of Director

MOE 17-094 (8-74)

ULV FOGGING PATTERN 1975

AREA COVERED PER WEEK

Figure 8

As is evident, the pattern of fogging programme was irregular due to varying weather conditions (see Figure #8). Staff tried to cover most of the Township once per week; most of the work was confined to areas of complaint. Chemical output relative to truck speed, wind velocity and air temperature was carefully monitored. All work was done early morning or late evening. Knockdown of adult mosquitoes appeared to be effective for 36 hours (layman observation in the beach area).

In previous years the township had used the Tifa fogger (warm fog) using Mal-Thane, a malathion-lethane mixture from Abell Waco. Use of the Micro-Gen, although it heated up quickly, was considered by the local abatement staff to be preferable to the Tifa Fogger because:

(1) it was easier to operate,

(2) fine adjustments in rate of application were possible,

(3) it was easier to maintain,

(4) it could be shut down more quickly, and

(5) it could be operated under less stringent weather conditions.

A thermal fog may have a psychological advantage because people can see it and smell it but the cloud of fog is so light that it could be dispersed by wind so quickly that efficacy was questionable. Some complaints were received by township staff about the 1975 fogging programme because the ULV "fog" was not visible; once they

were asked to monitor mosquito control, comments were more favourable. More public education in this area may be helpful.

The few legitimate complaints that were received centered around residences which had numerous cedar hedges and brush bordering the property which could harbour nuisance adult mosquitoes. Local fogging with a portable fogger should be encouraged in these circumstances.

(6) Summer Larviciding

No larviciding was undertaken to control populations of summer Aedes sp. as significant rainfall did not occur until early August and from then to early September. Showers were isolated and sporadic.

MARA TOWNSHIP

SUMMARY:

The Reeve and Township Clerk indicated at a meeting on September 3rd that they were very pleased with the mosquito abatement programme this year. This may in part be due to a low incidence of biting populations this year in comparison with previous years in response to a very dry season. No rainfall fell after the spring larvicide programme until the end of July. Rainfall since then (to early September) has been spotty and isolated; cattail swamps have been drier this year than in the past several years. This year the greatest nuisance mosquitoes were the spring *Aedes* complex. Presence of *Coquilletidae* or other nuisance permanent water mosquitoes was not confirmed but did not appear to present a significant problem. Cost of the programme was provided by F. Mangan, Township Deputy Clerk, and is indicated in the following table:

COST OF PROGRAMME

Cost of Labour:

2 salaried personnel, 3 full weeks	$	1,450.00
1 hourly staff, 55 hours x $8.00/hr. for fogging		440.00
1 hourly staff assisting in surveying		42.00

Equipment Cost:

A. Larviciding 5000 pounds Abate 2G @ 55¢ — 2,750.00
4125 pounds Abate 2G @ 59¢ — 2,433.75

Labour and Equipment:

Caledon Helicopter $1.00/Acre	2,330.00
McEachern Transport *	225.85
Township Payroll **	300.00

* Moved chemical from Toronto terminal to Brechin.

** Use of truck for one week to ferry granular to helicopter.

(Portable granular seeder borrowed from Orillia).

TOTAL	$	8,009.60
Inventory of Abate 2G - 2,125 lbs. left:		1,168.75
	$	6,840.85

B. Adulticiding:

Tifa Fogger parts from Abell Waco - not used	$	890.25
Micro-Gen ULV sprayer - new		2,887.50
Micro-Gen ULV sprayer - upkeep and repair		89.22
Material Abell Waco, two 45-gallon drums (pyrethrin-piperonyl butoxide):		2,343.60
McEachern Transport		20.08

C. Miscellaneous

Examination Fees	$	15.00
Advertising		23.31
Orillia Air Service - breeding site surveillance		21.00
Expenses for travel to seminars		300.00
Licence plaque		2.00

The cost of mosquito abatement is derived from taxes. In 1974, when no larviciding was done, $2.50 per property assessment to pay for fogging (Tifa Fogger plus two Swing fogs). In 1975, the larviciding and ULV spraying was assessed at $8.00 per property.

WALLACEBURG

(1) History

The town of Wallaceburg first expressed a desire to control their mosquito population in a letter from the town manager (Mr. R.E. Crombie) to the Pesticides Control Section on August 12, 1974. A meeting was held with Ministry staff on February 3, 1975 to explain the details of an abatement programme. The town council was briefed on general aspects of such a programme on February 11th, and decision was made to implement an abatement programme on February 27th.

(2) Education, Training and Licencing

The Works Department Superintendent, Mr. George Segaert, was officially designated as the person in charge of the mosquito programme and made application for an Operators, Class 10 Land exterminators licence (endorsed for mosquito adulticiding), Class 3 Water exterminators licence (endorsed for mosquito larviciding) and an Aquatic Nuisance Control permit.

(3) Field Mapping and Monitoring Breeding Sites

Under the supervision of G. Segaert, Wallaceburg employees mapped out all potential breeding sites within the town boundaries (approximately 4 square miles) as per the procedure outlined in the 1974 Orillia Report (Ministry of the Environment). Mosquito larvae found in pools in a woodlot immediately south of Maplewood Crescent near the town's western boundary on April 22nd were collected and submitted to the

University of Guelph (Dr. R.E. Wright) for species and instar identification; Aedes canadensis, A. fitchii, A. stimulans, A. sticticus, and A. implicatus were identified. All bodies of water found by dipping to contain larvae were systematically identified with fluorescent orange paint either applied to stakes or adjacent trees and were monitored for larval development and treatment timing.

(4) Spring Larviciding:

(a) Materials used

Abate 2G was selected as the larvicide. To apply this, two 8 lb. capacity U.S. Borax PCB Model spreaders were purchased.

(b) Calibration of equipment

Density of vegetation coupled with smallness and randomness of larval habitats rendered standard directions for calibration absurd. After some rough testing using calcium chloride, the spreaders were set to apply a 10 foot swath with the material aperture set at #2. The estimated correct average dose (1 granule per 1.5 - 3 inch square) correlated with the recommended rate of application of Abate 2G of 2.5 - 5 pounds product per surface acre.

(c) Treatment Details

Monitoring of the woodland pools containing spring larvae species revealed more than 100 larvae per dip when sampled May 1st. Treatment of marked pools in the problem woodlot (5 acres in size) was therefore undertaken

on May 3rd (10:00 A.M. - 12 noon). Two staff were designated applicators and wore rubber gloves, goggles and boots. A pre-treatment survey revealed one wet spot contained several pupae.

As application of larvicide to marked pools proceeded in an orderly manner from west to east, G. Segaert dipped for larvae in unmarked pools. In several cases, larvae were found and these additional habitats were tagged for treatment.

(d) Efficacy

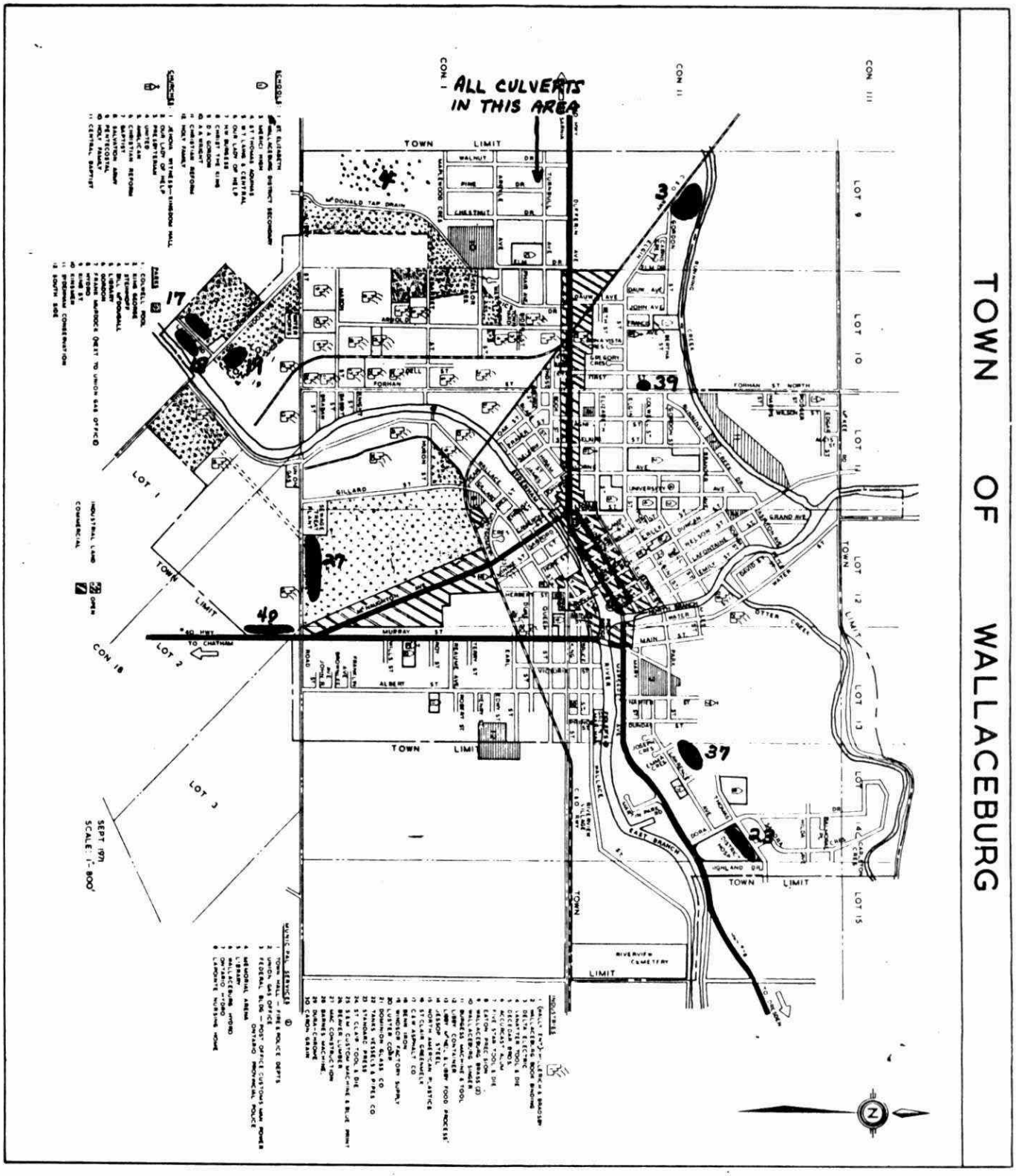
The applicators were conscientious in their job and excellent coverage with Abate was realized. A total of five pounds product Abate 2G was used. On May 5th, Wallaceburg staff dipped for larvae in the treated areas. Two spots containing larvae were immediately retreated. The initial treatment was deemed to have caused a mortality close to 100%.

(e) Residues

Prior to actual treatment three pools within the woodlot (treatment site #4) were chosen to monitor for Abate residues in water and sediment. Samples were submitted to the Provincial Pesticides Residue Testing Laboratory; appreciation is extended to Dr. R. Frank for providing the analytical capability. Results are documented in Tables #1 and #2.

Figure 1

LARVICIDING SITES 1975
(by pool number)



ABATE RESIDUES (ppm)

	SITE 1		SITE 2		SITE 3	
	Water	Sediment	Water	Sediment	Water	Sediment
Before Treatment	N.D. *	N.D. 44% water	N.D.	N.D. 58% water	N.D.	N.D. 51% water
1 Hour Post Treatment	0.013	N.D. 37% water	0.008	N.D. 52% water	0.003	N.D. 29% water
24 Hours Post Treatment	0.004	N.D. 43% water	0.001	N.D. 59% water	0.002	N.D. 53% water
48 Hours Post Treatment	0.002	N.D. 47% water	N.D.	N.D. 59% water	N.D.	N.D. 54% water
7 Days Post Treatment	N.D.	N.D. 58% water	no sample (dried up)	N.D. 63% water	N.D.	N.D. 72% water

* N.D. - not detectable

Limits of detection: water: 0.001 ppm
sediment: 0.1 ppm

Table 2

ABATE RESIDUE SITE OBSERVATIONS

	SITE 1	SITE 2	SITE 3
Description	leafy bottom 10 feet long; 5 inches wide maximum depth 10 inches	leafy bottom 24 feet long; 7 feet wide maximum depth 6 inches	leafy bottom, algae 15 feet long; 10 inches wide; maximum depth 7 inches
Pre-Treatment	mosquito larvae abundant; easily visible to naked eye	mosquito larvae numerous	mosquito larvae abundant; easily visible to naked eye
1 Hour Post Treatment	no mortality visible; Abate granules clearly visible	no mortality visible; Abate granules visible	no mortality visible; Abate granules clearly visible
24 Hours Post Treatment	no larvae visible, slight amount of Abate granules visible; other aquatic fauna observed	1 living larvae (4th instar)	no larvae visible slight amount of Abate granules visible
48 Hours Post Treatment	water level dropped 3 inches; no larvae visible other aquatic fauna (Gammarus sp) visible	1 living larvae, water level down 3 inches; other fauna visible	water level dropped 3 inches; no larvae visible; other fauna such as Gammarus sp observed
7 Days Post Treatment	water level down 6 inches; no larvae present	water level 6 to 8 inches below pre-treatment level (just wet spot)	slight traces of granules remain, water level down 6 inches; no larvae visible but other fauna.

Treatment was undertaken May 3, 1975. Abate granules seeded over pools in deciduous woodland.

(5) Summer Larviciding

Monitoring of mosquito larvae habitat continued from May through August with treatment when necessary:

DATE (1975)	SITE #	QUANTITY OF ABATE GRANULAR USED
May 3	#4	10 lbs. product
May 5	#4	5 lbs. product
May 26	#39	<0.5 lbs. product
June 2	#40	1 lb. product
June 4	#3	3 lbs. product
June 12	#23, 41	1 lb. product
June 18	50 catch basins all over town	<5 lbs. total product
June 25	#27, 37, 40	3 lbs. product
August 26	#17, 18, 19	3.5 lbs. product

Location of sites may be found in Figure #1. Weather conditions were monitored (see Table #3) as an index of mosquito larvae emergence. Larvae samples were collected on August 25th (Figure #2) were identified as:

A.	Baldoon Road	Aedes riparius	1
		Aedes vexans	9
B.	Forhan Road	Culex restuans	6
		Culex pipiens	3
C.	Murray Street	Culex restuans	1
		Culex pipiens	9

THE TOWN OF WALLACEBURG

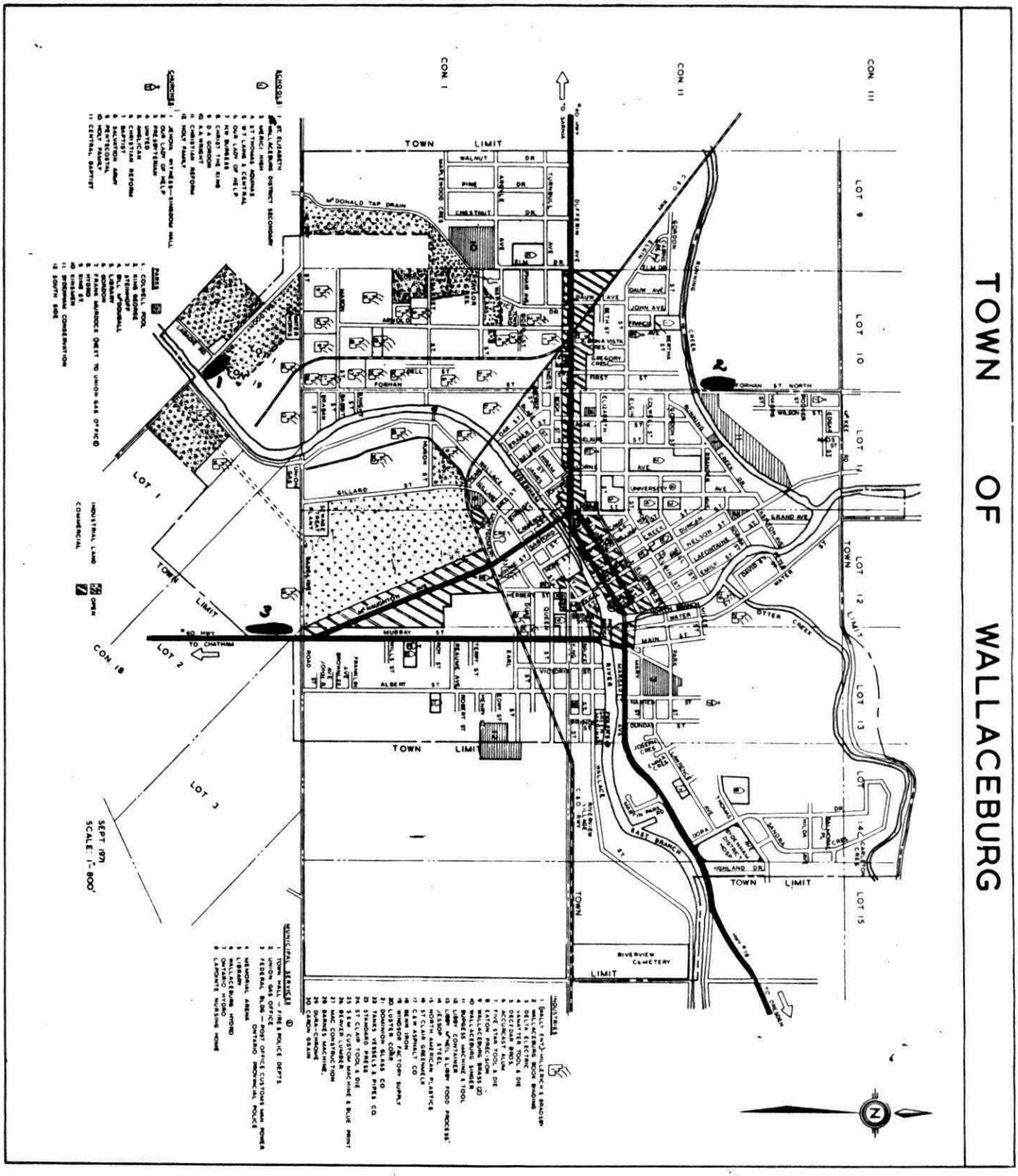
Table 3

WALLACEBURG, ONTARIO, CANADA

WEEK OF (1975)	AVERAGE RAINFALL (inches)	(cm)	AVERAGE TEMP. (F^O)	(C^O)	MAX. TEMP. (F^O)	(C^O)	MIN. TEMP. (F^O)	(C^O)
April 1 - 5	48 (snow)	121.9	30.75	-1.5	36	2	24	-4
April 6 - 12	---	---	32	0	36	2	24	-4
April 13 - 19	2.6	6.6	43	6.1	58	15	25	-4
April 20 - 26	1.2	3.1	46.5	8.0	58	15	36	2
April 27-May 3	0.5	1.3	52.0	11.1	66	19	44	7
May 4 - 10	0.5	1.3	51.5	10.8	60	16	45	7
May 11 - 17	---	---	55.0	12.7	62	17	48	9
May 18 - 24	0.3	.76	71.6	22.0	92	33	63	17
May 25 - 31	0.5	1.2	65.8	18.7	68	20	60	16
June 1 - 7	2.5	6.3	63.8	17.7	72	22	56	13
June 8 - 14	0.5	1.2	52.8	11.6	67	20	52	11
June 15 - 21	0.5	1.2	72.3	22.4	79	26	66	19
June 22 - 28	1.4	3.6	70.4	21.3	77	25	66	19
June 29-July 5	---	---	74.5	23.6	78	26	73	23
July 6 - 12	0.1	.25	68.0	20.0	78	26	60	16
July 13 -19	0.8	2.03	65.5	18.6	73	23	61	16
July 20 - 26	---	---	68.5	18.6	77	25	64	18
July 27 -Aug 2	1.1	2.79	71.4	21.1	76	25	65	18
Aug 3 - 9	0.1	.25	63.2	17.3	72	22	61	16
Aug 10 - 16	0.6	1.52	72.5	22.5	81	27	68	20
Aug 17 - 23	1.9	4.82	63.6	17.5	68	20	60	16
Aug 24 - 30	0.6	1.52	70.3	21.2	76	25	61	16
Aug 31-Sept 6	0.4	1.01	61.6	16.5	70	21	54	12
Sept 7 - 13	1.2	3.04	57.4	14.1	65	18	50	10
Sept 14 - 20	0.5	1.27	59.4	15.2	66	19	54	12
Sept 21 - 27	0.4	1.01	54.0	12.3	58	15	48	9

Figure 2

LOCATIONS OF LARVAL COLLECTIONS
AUGUST 25, 1975

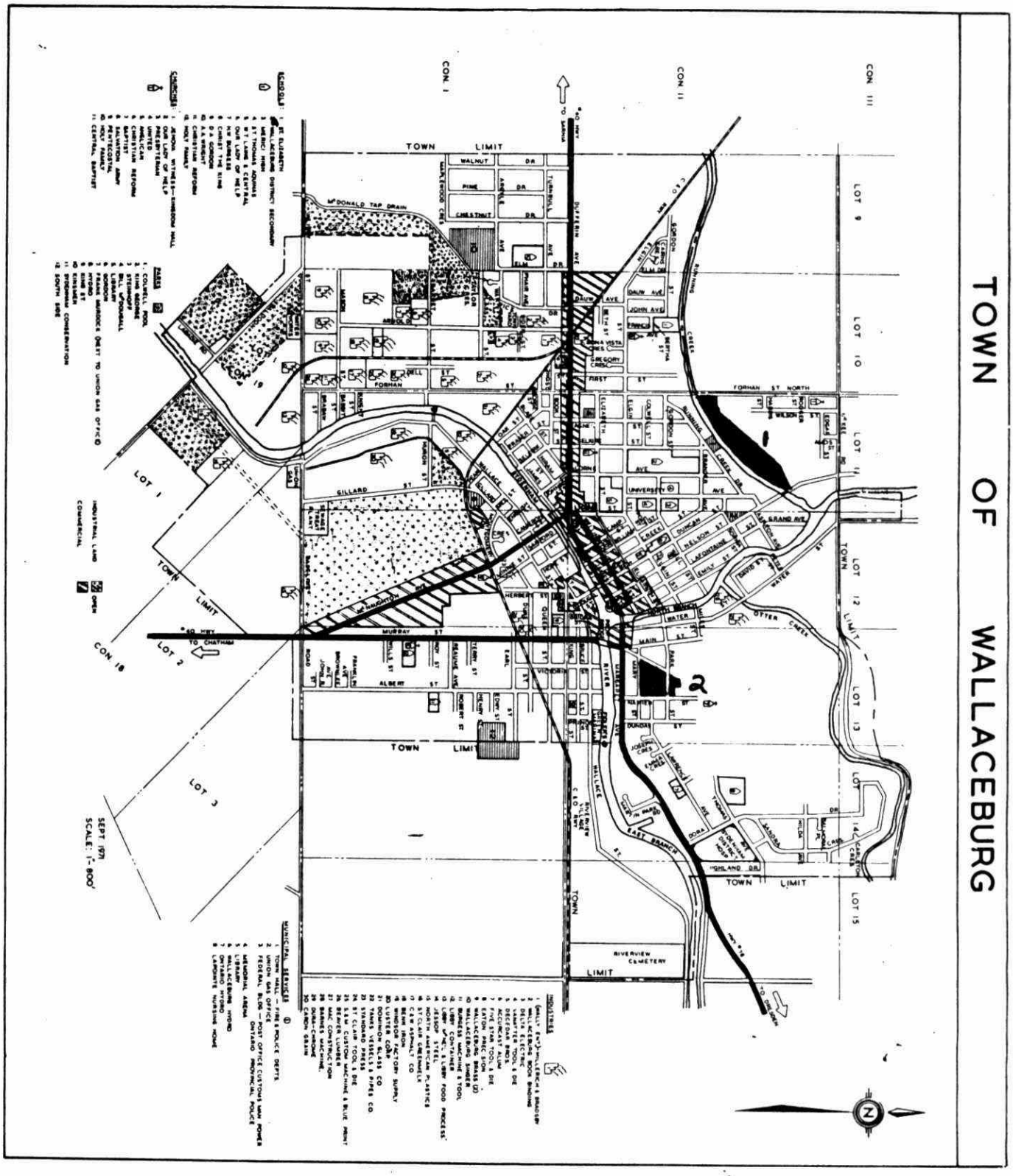


LEGEND:

1. Baldoon Road
2. Forhan Road, North
3. Murray Street

Figure 3

ADULTICIDING SITES 1975



LEGEND:

1. Crothers Park
2. Steinhoff Park

(6) Adulticiding

Two parks were treated with malathion fog (Malfog) generated by a Dynafog DH 90 (Figure #3):

LOCATION	DATE	TIME	RESULTS
(1) Steinhoff Park (450' x 700')	1. 29/7/75	9:00 p.m.	good control
	2. 10/9/75	8:00 p.m.	excellent
	3. 17/9/75	6:30 a.m.	good

A total of 9 quarts of Malfog were used.

(2) Crothers Park (450' x 900')	1. 28/6/75	8:00 a.m.	poor

A total of 2 quarts of Malfog were used; structures prevented adequate treatment.

SUMMARY

Man-hour (crew) requirement for the Wallaceburg mosquito abatement programme has been broken down in the following manner:

February, 1975	18 man-hours
March	2 man-hours
April	24 man-hours
May	47 man-hours
June	84 man-hours
July	7.5 man hours
August	17 man-hours
September	11.75 man-hours
	(211.27 man-hours)

The Works Department Superintendent spent a total of 118.75 hours over the 8 months (14.8 hrs/mo.) to bring total man-hours devoted to all aspects of control to 330.

The number of staff involved was 4 (not all the same time).

Cost of the entire programme was provided by G. Segaert:

Cost of Programme

Cost of labour	
330 hours x $5.00/hr.	$ 1650.00

no additional help was hired so labour cost was absorbed in the regular road budget.

Equipment Cost

1 (one) Dyna-fog DH 90 (see literature in appendix)	429.50
1 (one) 45 gal. drum Malfog (malathion diluted) (only small amount, 11 quarts were used)	209.25
2 PCB Spreaders @ $24.00 each, Model B.	48.00
3 bags Abate (granular 2G) at $17.50/bag (only 1½ bags were used)	52.50
Cost of safety equipment (on hand)	---
Total Costs	$ 2389.25

It should be noted that although a figure of $2,389.25 was attached to the programme, no additional labour was hired; use of equipment purchased will be indefinitely perpetuated and much of the chemical

purchased is available for future use.

Breeding Habitat Alteration

The Works Department, by way of permanent control measures, filled in low spots over the summer and placed storm drains in low areas where it was possible to drain probable breeding sites.

ORILLIA

(1) History

The City of Orillia conducted a mosquito larvicide programme in 1974 for control of the spring Aedes sp. population. In 1975, the programme was expanded to include larviciding of summer Aedes vexans breeding sites and continuation of removal of all mosquito breeding sites by filling low areas and improving surface water drainage where possible.

(2) Education, Training and Licencing

Wherever possible, employees involved in the larviciding programme in 1974 were used in 1975. These men were updated as to the procedures and new employees were provided with training and given more thorough instructions.

(3) Field Mapping and Monitoring Breeding Sites

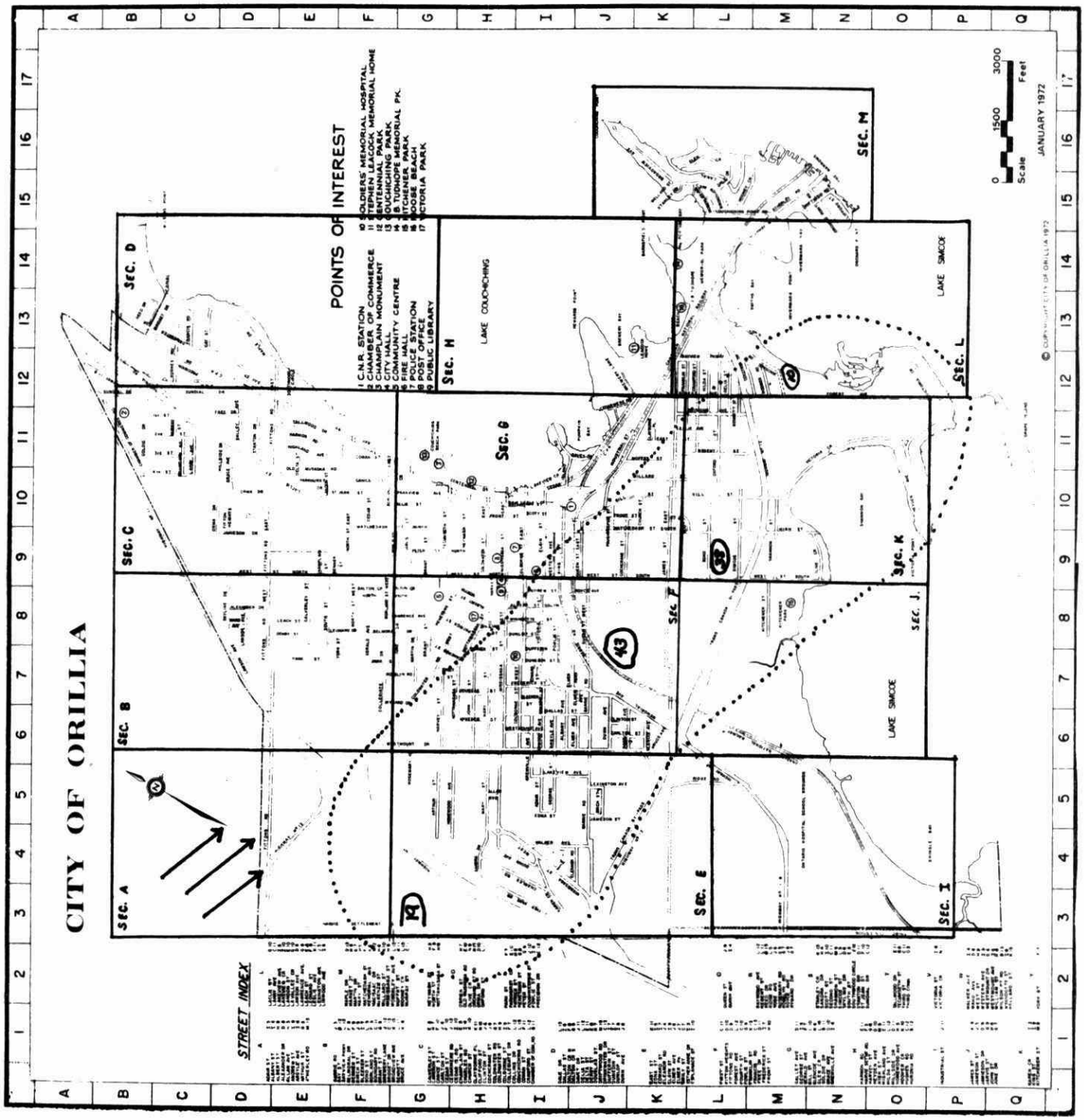
Updating of existing mapped pools commenced in late April. Due to heavy snows late March and mid-April, the snow-melt pools previously mapped had changed size; new ones were noted and monitored for larvae development.

On May 1st, the presence of mosquito larvae (mostly first instar) were detected. Samples of larvae from representative pools were collected by staff of the Public Works Department and transported to the University of Guelph (Dr. R.E. Wright) for species and instar identification. Figure #1 identifies locations of the larvae samples taken and identified in Table #1.

Figure 1

SAMPLING SITES FOR SPRING AEDES SP. AND ABATE RESIDUE MONITORING

May 1, 1975



Prevailing westerly winds

..... Low lying area of city subject to water accumulation

MOSQUITOES COLLECTED MAY 1, 1975 CITY OF ORILLIA

POND SITE	SPECIES FOUND	POND DESCRIPTION
K 38	*Aedes stimulans* *	- residential area, woodland, - 10-15 2nd instar per dip.
L 10	*Aedes cinereus* *Aedes sticticus* *Aedes canadensis* *Aedes excrucians*	- swamp woodland; leaf bottom. - 8-9 1st instar larvae per dip. - most found near new grass.
E 19	*Aedes sticticus* *Aedes stimulans* *Aedes fitchii*	- open field; straw grass and moss. - 75-110 larvae per dip 1st, 2nd, and 3rd instar.
E 12	no larval samples taken	- silt bottom; partly shaded.
F 43	identification not possible	- 5 1st and 2nd instar per dip. - pockets of heavy density. - very organic; dumping area for leaves.

* Listed in order of decreasing density.

(These ponds were selected by the Public Works Department as representative of the different types of pool areas).

(4) Spring Larviciding

(a) Materials Used:

A coarse mesh size of Abate 2G was used once 50 pounds of the fine mesh purchased in 1974 was used up. To apply the granular portable seeders were used; two new ones were purchased in 1975 to replace those worn out in 1974. The liquid formulation was applied by back-pack sprayers.

(b) Calibration of Equipment

The method of calibration of the seeder applicators and portable back-pack sprayers was the same as that outlined in the 1974 Orillia Report (Ministry of the Environment).
In review of calibration of the rotary seeder, this equipment has a chart stamped on the bottom which lists various types of seeds and their corresponding seed aperture diameter setting to give deposition of a specific weight per unit area. The seed types were correlated to the mechanical size of Abate 2G to obtain the approximate aperture setting for the application. The operators then filled their seeders with a known weight of granular pesticide and began to "seed" a pre-measured acreage at regular walking speed. They then compared the actual weight dispensed with the recommended values and made fine adjustments to the aperture accordingly. In field operations where walking conditions were

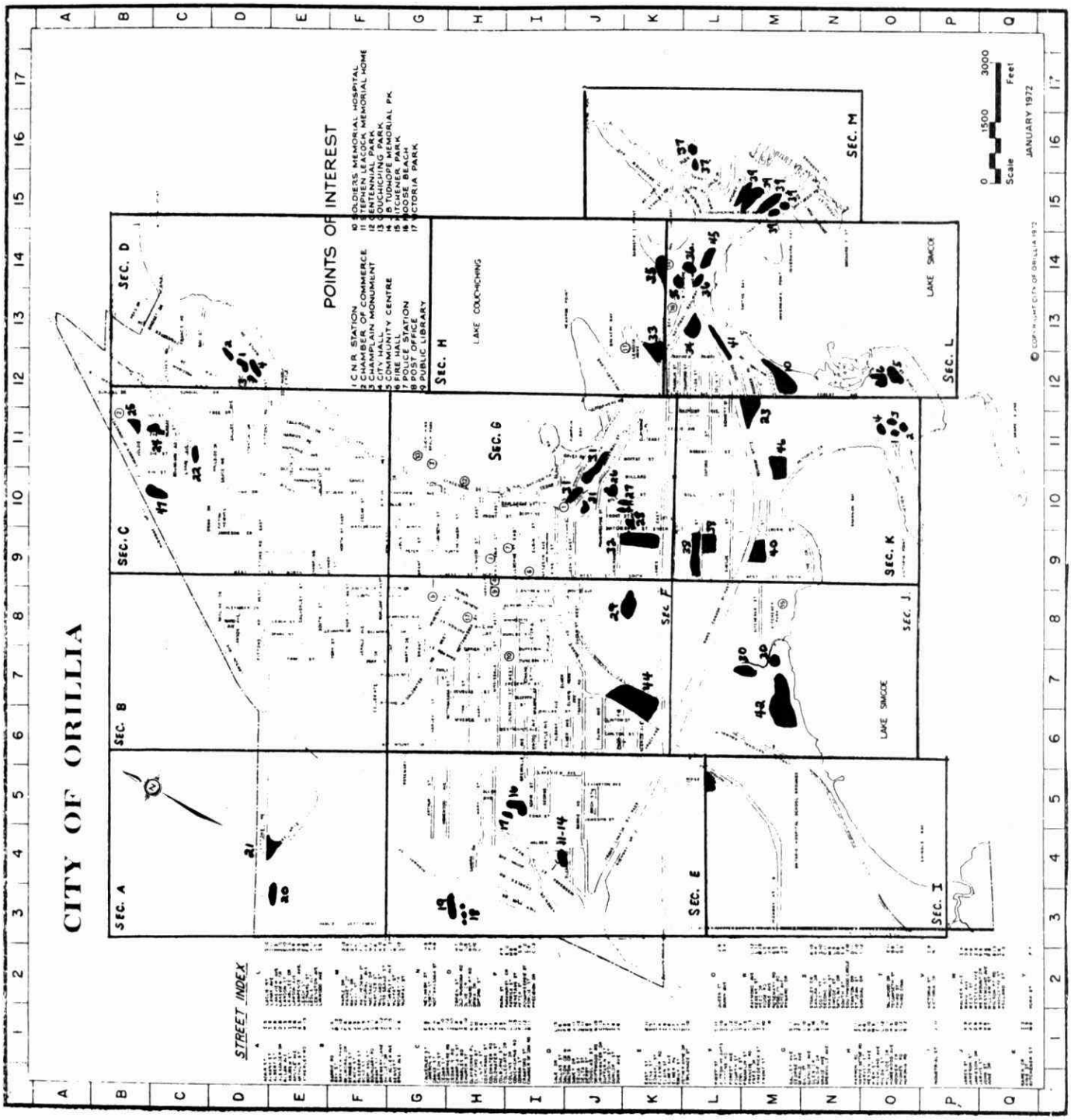
good and average speed above regular one, aperture size was increased. In marshy areas where walking was hindered by vegetation, the aperture was correspondingly decreased. It is important to recalibrate this equipment as aperture closure becomes worn or when the operator has been away from the field for a period of time (and familiarity with acceptable dispersal patterns in pools of the approved rate of application lessens).
Calibration of the liquid back-pack sprayers was made as outlined in the 1974 Orillia Report (Ministry of the Environment).

In addition, staff of the Works Department experimented with a motorized air blast granular back-pack sprayer KWH 66 Whirlwind Holland Duster provided by Kem San, Oakville, For calibration, an area of 4800 square feet was marked off. Five pounds of granular lawn fertilizer (equivalent in bulk to 3 pounds product Abate 2G) was sprayed over the area in a series of 9 trials. Output was calibrated to spray the 5 pounds of fertilizer over 43,200 square feet (approximately one acre). The resulting application rate (equivalent to 3 pounds Abate 2G per surface acre) was median in the registered label rate range (2.5-5.0 lbs/A).

In the field, a number of different types of pools were tested with this piece of equipment;

Figure 2

NUMBERED POOLS: SITES OF SPRING LARVICIDE TREATMENT, 1975



open pools, such as pool #19 on the third concession could be easily treated once the total area and thus the total quantity of material be be used could be measured. The speed of application in such areas is much improved over a hand-crank spreader, since the Air Blast gave an adequate pesticide deposition through a distance of 22 to 26 feet compared to the hand seeder which has a 12 to 14-foot range.

In densely covered areas such as pool #38 on Bond Street, the machine proved unsatisfactory as the Abate 2G could not evenly penetrate the thick underbrush being airblown.

As well, the operator could not make a straight line pass as the machine would get snagged on hanging branches. This cut down on the application time and was harder on the applicator. Therefore, for this type of habitat, field crews returned to use of the smaller, more portable seeders or liquid back-pack sprayers. One disadvantage noted was the gneeration of Abate dust produced by the air blast; this is also a problem with hand-crank machines (formulation problem) but it appeared greater in use of the Whirlwind back-pack.

(c) Treatment Details

May 1st mosquito larvae were detected. Due to extremely warm weather conditions, the rate of

development of the larvae through succeeding instar stages was accelerated particularly in the open swampy grassland areas. The first larvicide treatments began on May 6th; pools where the water warmed up earliest and contained the more advanced stages of larval development were treated first. The granular formulation of larvicide was used in more open areas where the seeders were easier to operate; the emulsifiable concentrate was applied where pools were small and/or in heavily wooded areas where use of seeders was more difficult. An inert red dye which dissipates in a few hours (less than 24 hours) was added to the sprayers so pools treated with Abate 4E could be easily identified. Public Works staff were extremely pleased with this system. The spring larviciding programme involved four men almost full-time over the first three weeks of May (the first week for surveillance; the second two weeks for actual treatment and follow-up); treatment for spring Aedes sp. concluded on May 21st. A total of approximately 84 acres were treated between May 6th and May 24th, with either of the Abate formulations (Figure #2). This was a reduction from the 190 acres similarly in 1974 and can be partially accounted for when the two following points are considered:

(1) Not all the infested snow-melt pools could be treated within the time frame of the planned programme (see Efficacy).

(2) Over 1974 and 1975, a conscientious effort was made to improve drainage and reduce the available breeding sites.

(d) Efficacy

Accelerated development of the spring mosquito larvae resulted in timing of a larvicide application late for control of all infested snow-melt pools. Mosquito pupae are not affected by Abate insecticide; approximately one-third of the snow melt pools escaped treatment because of the presence of pupae (rather than larvae) at the planned time of larvicide application. As well, rains in May raised water levels in some of the pools diluting the insecticide to the point where effectiveness was minimized. In spite of these setbacks, control was realized in a large number of cases in relation to complaints of nuisance adults received by the Works Department. Consideration was given to possible use of an adulticide in a fogging programme but the adults were not biting in significant numbers by mid-June to warrant it. Continuation of extremely warm weather conditions likely affected the adults' life span.

It is important to note that control, even using well-trained, experienced personnel will vary from season to season as field conditions change.

(e) Residues

The representative larvae habitats for larval sampling (Figure #1) were monitored for Abate residues. Duplicate samples of sediment

and water pre- and post-treatment (1 hour, 24 hours, and 48 hours) were obtained and submitted to the Provincial Pesticides Residue Testing Laboratory in Guelph; appreciation is extended to Dr. R. Frank for providing the analytical capability. The results are documented in Table #2.

(5) Summer Larviciding

Water collection sites which were probable sources of Aedes vexans and Aedes dorsalis (ie., grassy depressions around highway cloverleafs and along roadsides or where summer rainfall could cause a rise in water levels) were monitored during the summer. Locations of these sites is indicated on Figure #3. If a large number of larvae were found during dipping, these pools were treated with larvicide. Where only a few larvae (less than 5 to 10 over several dips) were found, larvicide was not used. As the summer of 1975 was very dry in this area, relatively little monitoring or treatment for summer species was required.

(6) Adulticiding

Although some type of fogging programme was considered in early June when difficulty in controlling all sources of the spring Aedes sp. population was encountered, no adulticiding was undertaken.

(7) Breeding Habitat Alteration

Staff of the Works Department spent considerable time and effort this year to reduce all possible water

ABATE RESIDUES (2G FORMULATION)

SITE	PRE-TREATMENT		1 HOUR POST TREATMENT		24 HOURS POST TREATMENT		48 HOURS POST TREATMENT	
	Water	Sed.	Water	Sed.	Water	Sed.	Water	Sed.
K 38 (% water)	N.D.	N.D. (84%)	0.009	0.2 (84%)	N.D.	N.D. (80%)	N.D.	Trace (71%)
(Water temp.)	9.1°C.		9.1°C.		9.2°C.		11.8°C.	
Method:	Air blast applicator (experimental)							
L 10 (% water)	N.D.	N.D. (90%)	0.011	0.6 (89%)	0.006	0.1 (88%)	0.004	0.2 (90%)
(Water temp.)	11.0°C.		11.0°C.		10.9°C.		12.9°C.	
Method:	Granular seeder							
E 19 (% water)	N.D.	N.D. (84%)	.006	Trace (87%)	.004	Trace (89%)	N.D.	Trace (78%)
(Water temp.)	18.5°C.		18.5°C.		21.8°C.		27.3°C.	
Method:	Granular seeder							
E 12 (% water)	N.D.	N.D. (33%)	0.007	0.1 (81%)	0.005	1.8 (82%)	Trace	N.D. (75%)
(Water temp.)	21.0°C.		21.0°C.		27.8°C.		28.8°C.	
Method:	Granular seeder							

Sediment: readings: ppm (parts per million)
limit of detection is 0.1 ppm

Water: readings: ppm (parts per million)
limit of detection is 0.001 ppm

All samples were taken in duplicate and averaged. Theoretical rate of application was 3 pounds product/acre.

Figure 3

SITES MONITORED FOR SUMMER AEDES SP.

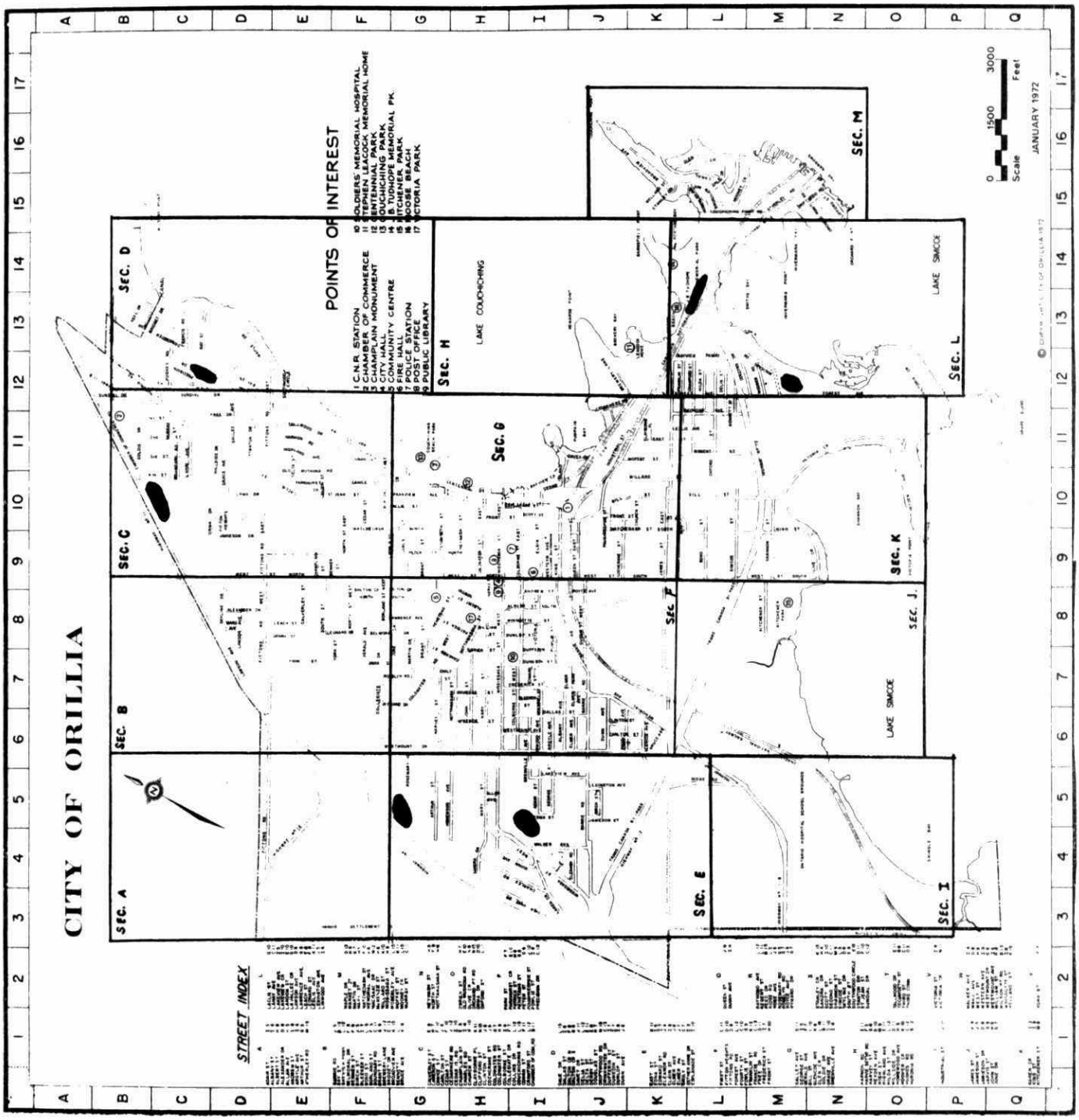
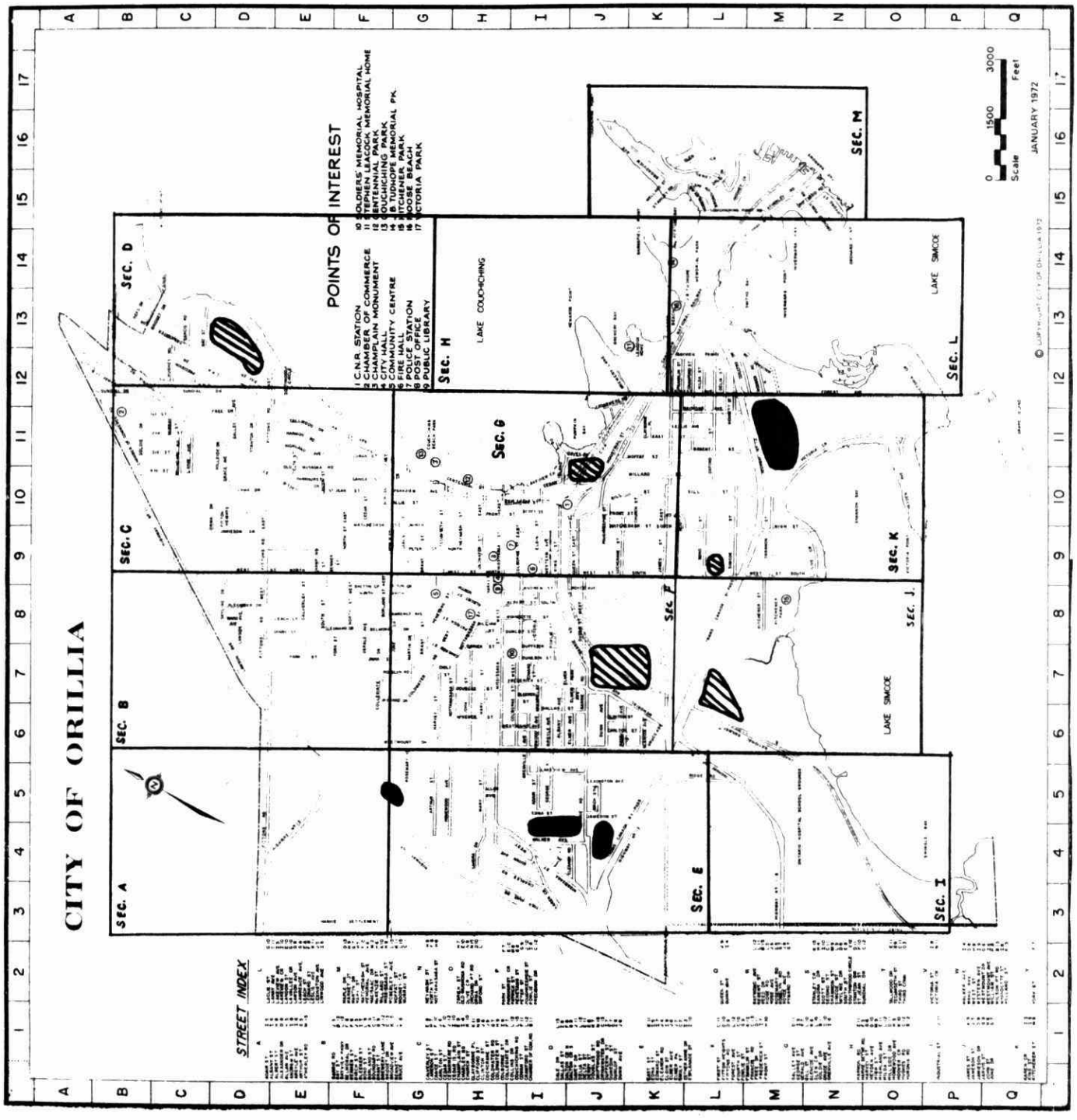


Figure 4

MOSQUITO HABITAT ALTERATION 1975



Proposed sites to be eliminated in 1976 or 1977

Breeding sites eliminated

ponding areas that are producing nuisance mosquitoes. Some of the areas filled or drained in 1975 or proposed for 1976 are located on Figure #4. Eliminating as many breeding sites as possible has reduced the work load of the filed crew in the larval surveillance and larviciding programmes.

Summary

The 1975 mosquito control programme comprised surveillance and larviciding for both spring and summer Aedes spp. mosquitoes. No adulticiding was undertaken. Total expenditures for 1975 including equipment, pesticide, labour, and vehicle depreciation was $2,440.00.